BEACH NOURISHMENT AND SEA TURTLES: A CASE STUDY ON HUTCHINSON ISLAND, FLORIDA

Ecological Associates, Inc.

Thanks to:

FDEP

Martin County, Florida

Applied Technology & Management


Erosion is a Matter of Perspective
Beaches Are Dynamic – They Change Seasonally
Loggerhead Turtles Do Quite Well on Narrow Beaches

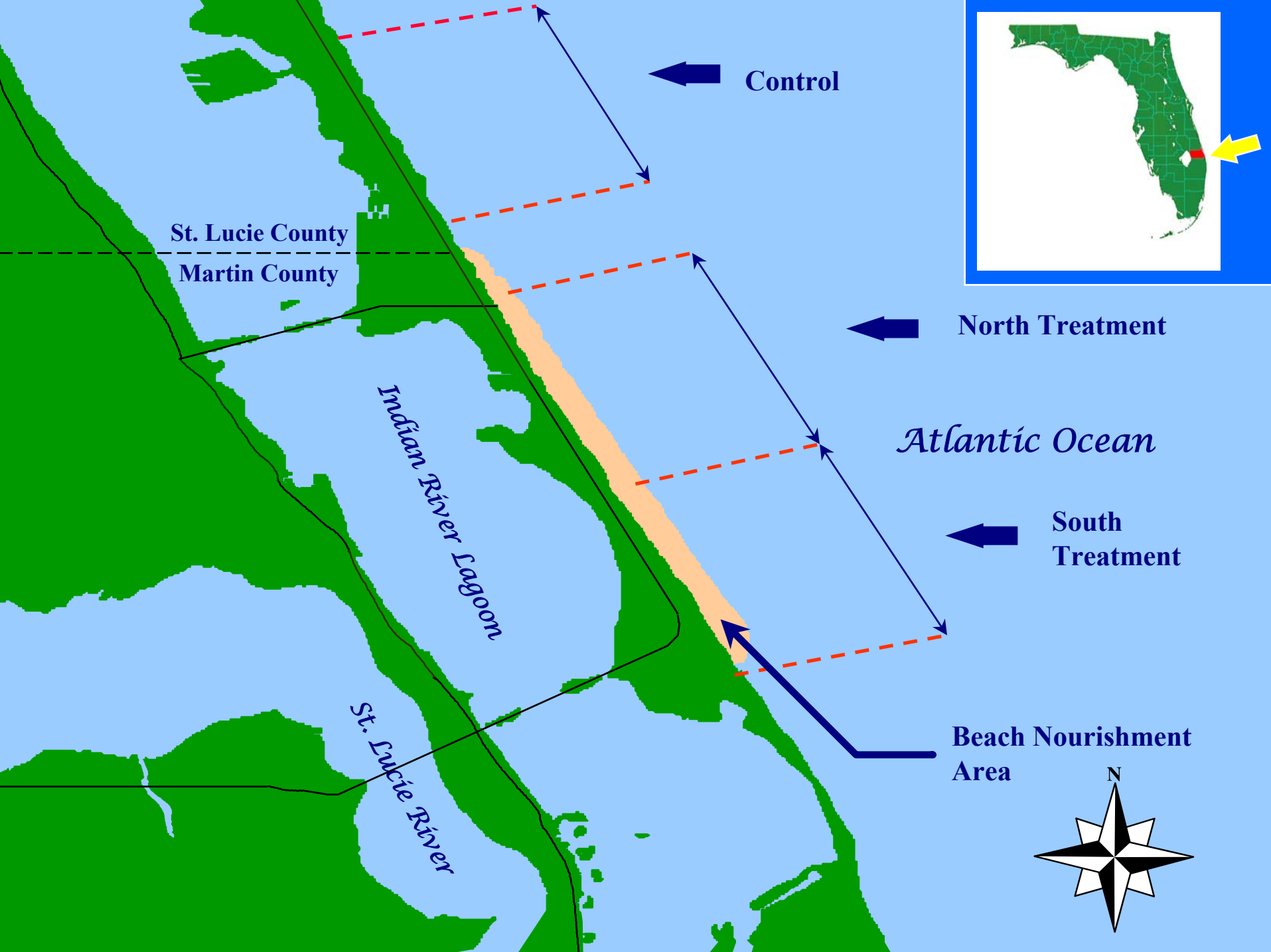

Wider is Better?

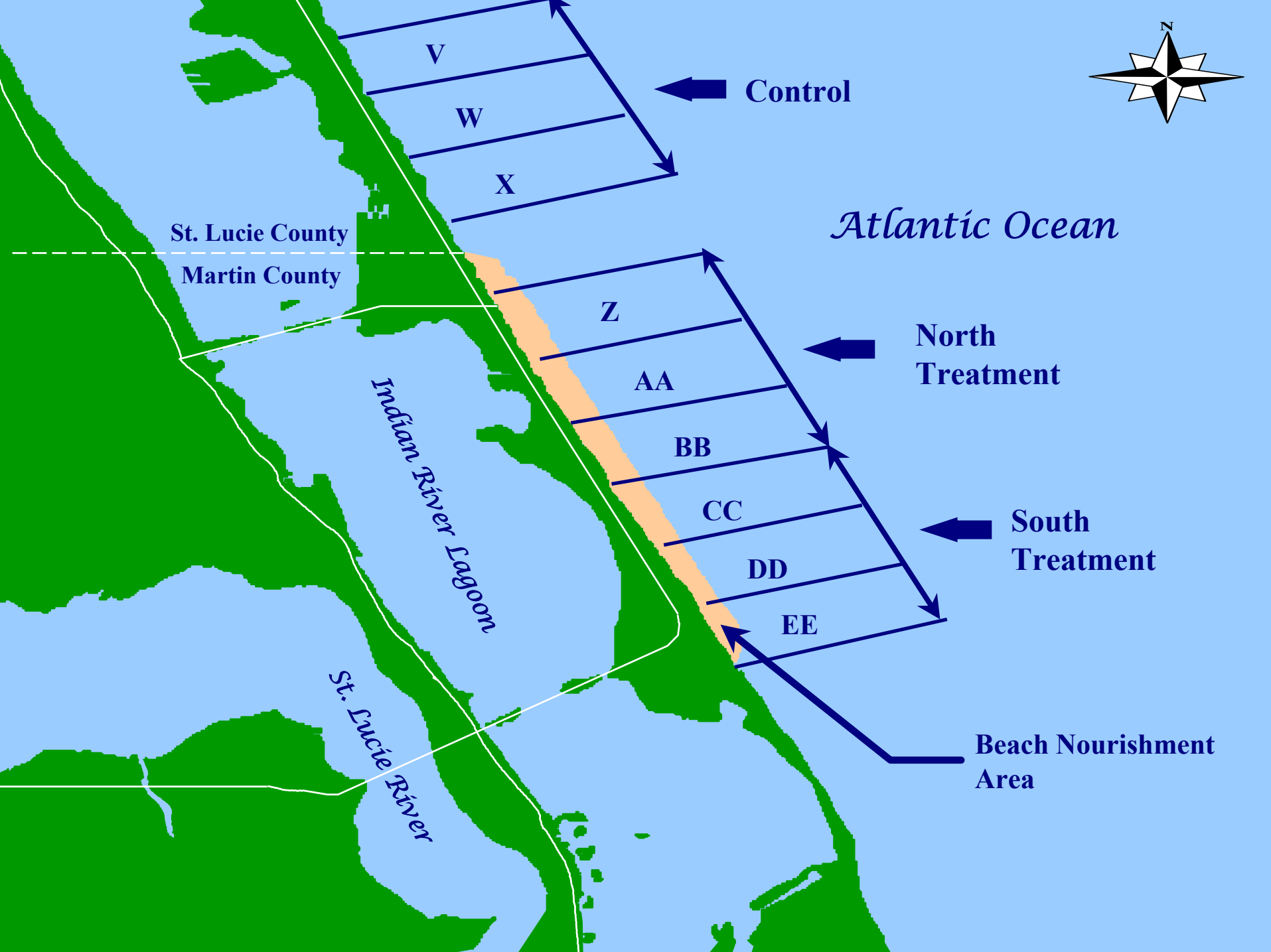

Beachfront Residents Have a Right to Protect Their Properties
Shoreline Protection is a Matter of Alternatives

EVALUATING BEACH NOURISHMENT PROJECTS

- Coastal Processes (Currents, Tides, Waves)
- Habitat Quality of Pre-Existing Beaches
- Characteristics of Borrow Sediments
- Beach Design (Length, Width, Interval)
- Construction Methods (Pumping, Tilling)
- Prevailing Weather

EAI


Control
St. Lucie County
Martin County
North Treatment
Indian River Lagoon
Atlantic Ocean
South Treatment
St. Lucie River
Beach Nourishment Area
N


N
V
W
X
Control
St. Lucie County
Martin County
Atlantic Ocean
Z
AA
BB
CC
DD
EE
North Treatment
South Treatment
Indian River Lagoon
St. Lucie River
Beach Nourishment Area

POTENTIAL EFFECTS OF BEACH NOURISHMENT

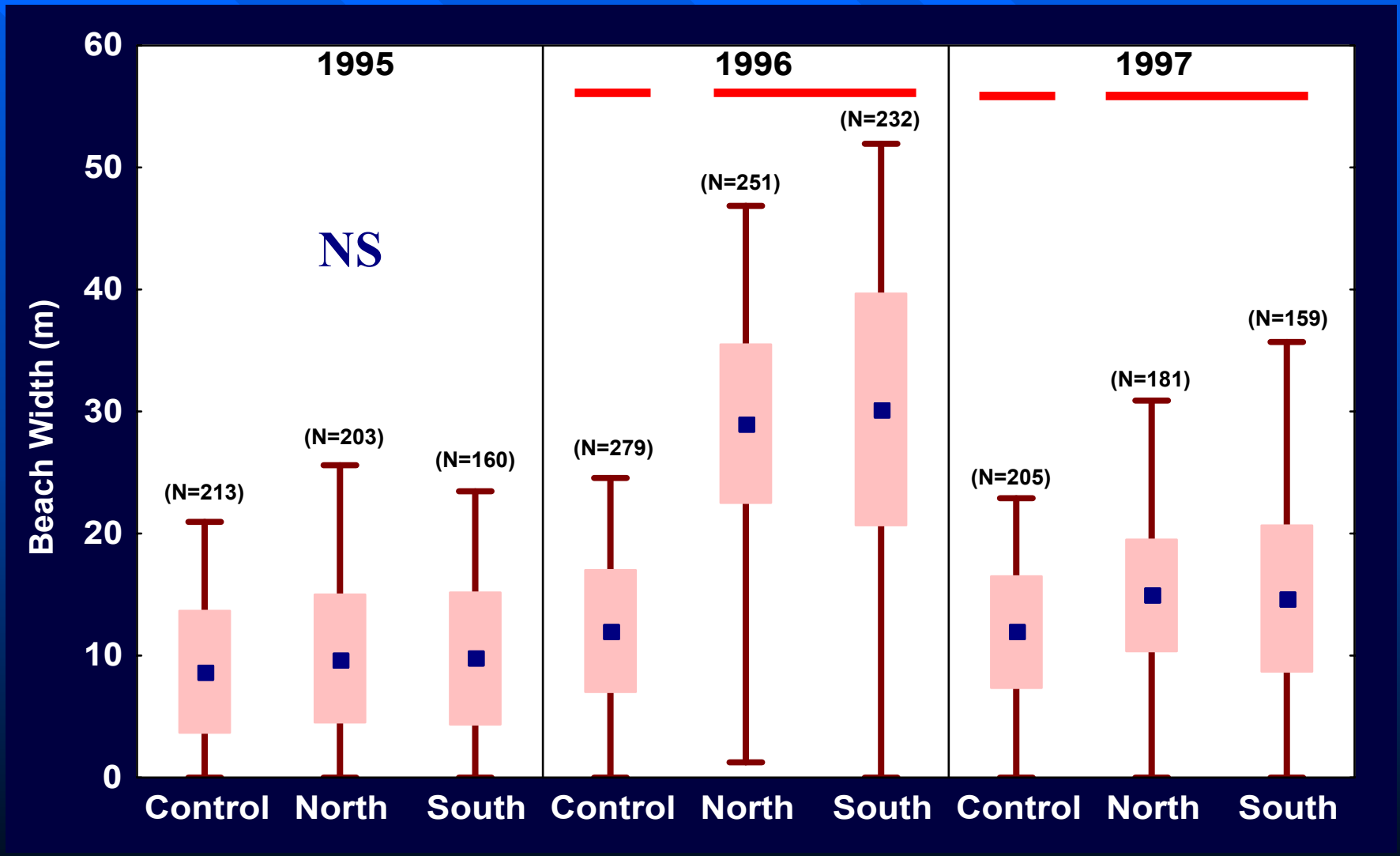
- Nesting Habitat (Quantity and Quality)
  - Nest Densities and Nesting Success
  - Energy Expenditures During Nesting
  - Spatial Distribution of Nests
- Incubation Environment
  - Reproductive Success
  - Hatchling Fitness and Emergence Patterns

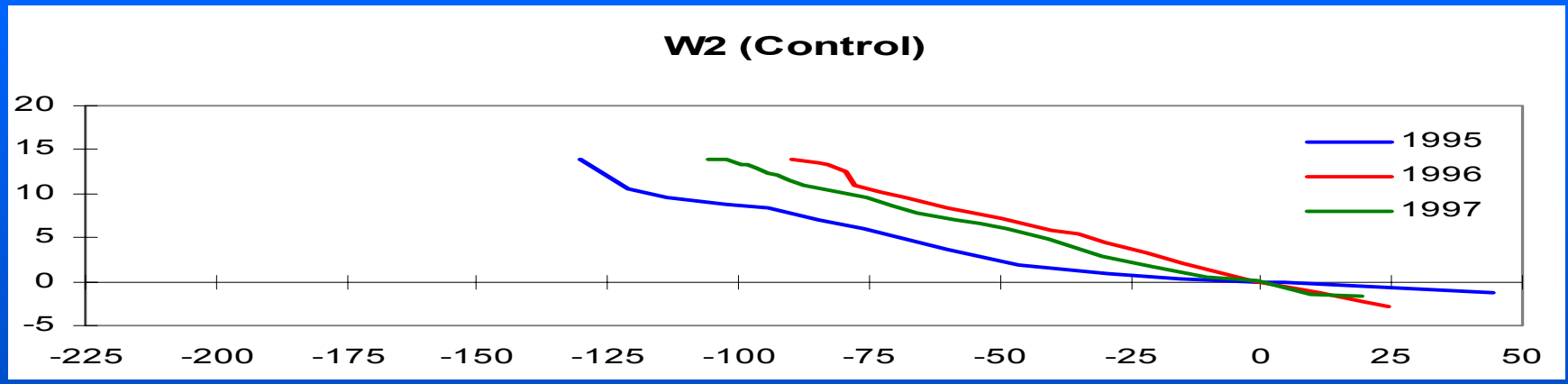
EA I

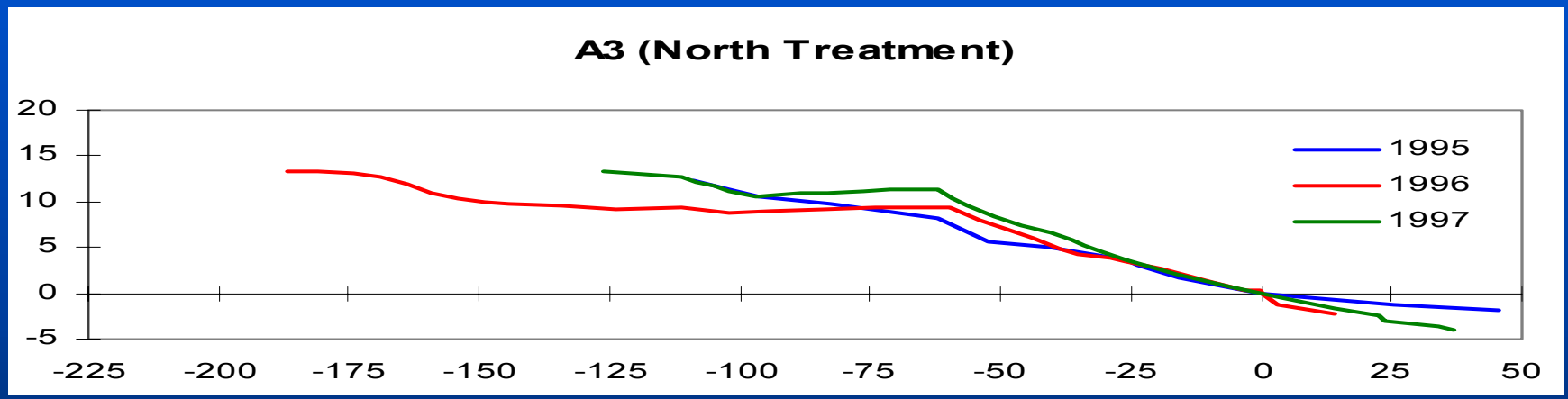
NESTING HABITAT (QUANTITY AND QUALITY)

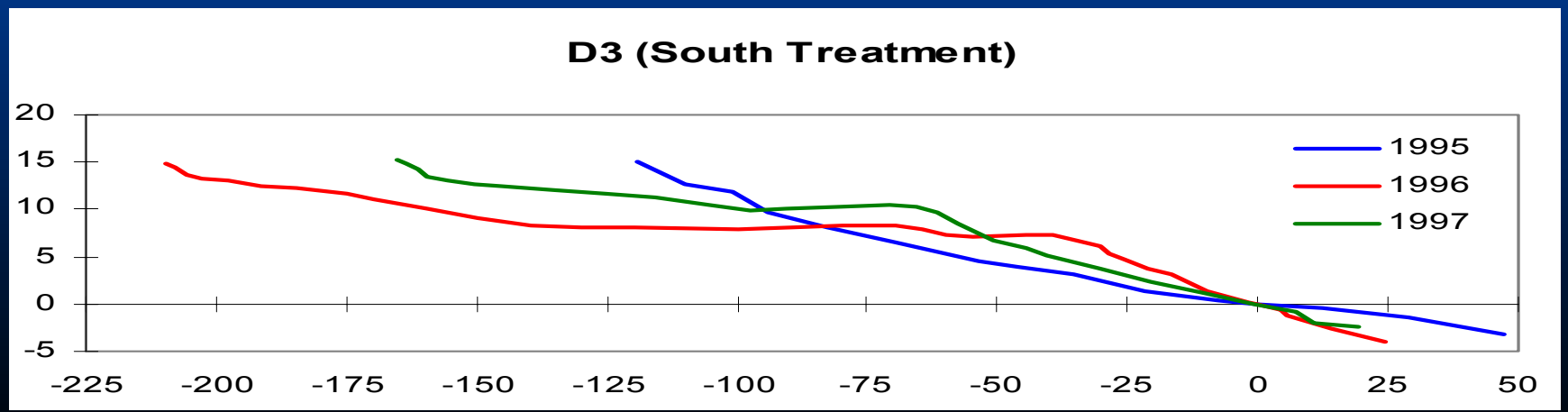
- Beach Profile (Width, Height and Slope)
- Sediment Compaction
- Sediment Grain Size and Color
- Temperature
- Moisture Content
- Gas Exchange

Beach Widths at Crawls

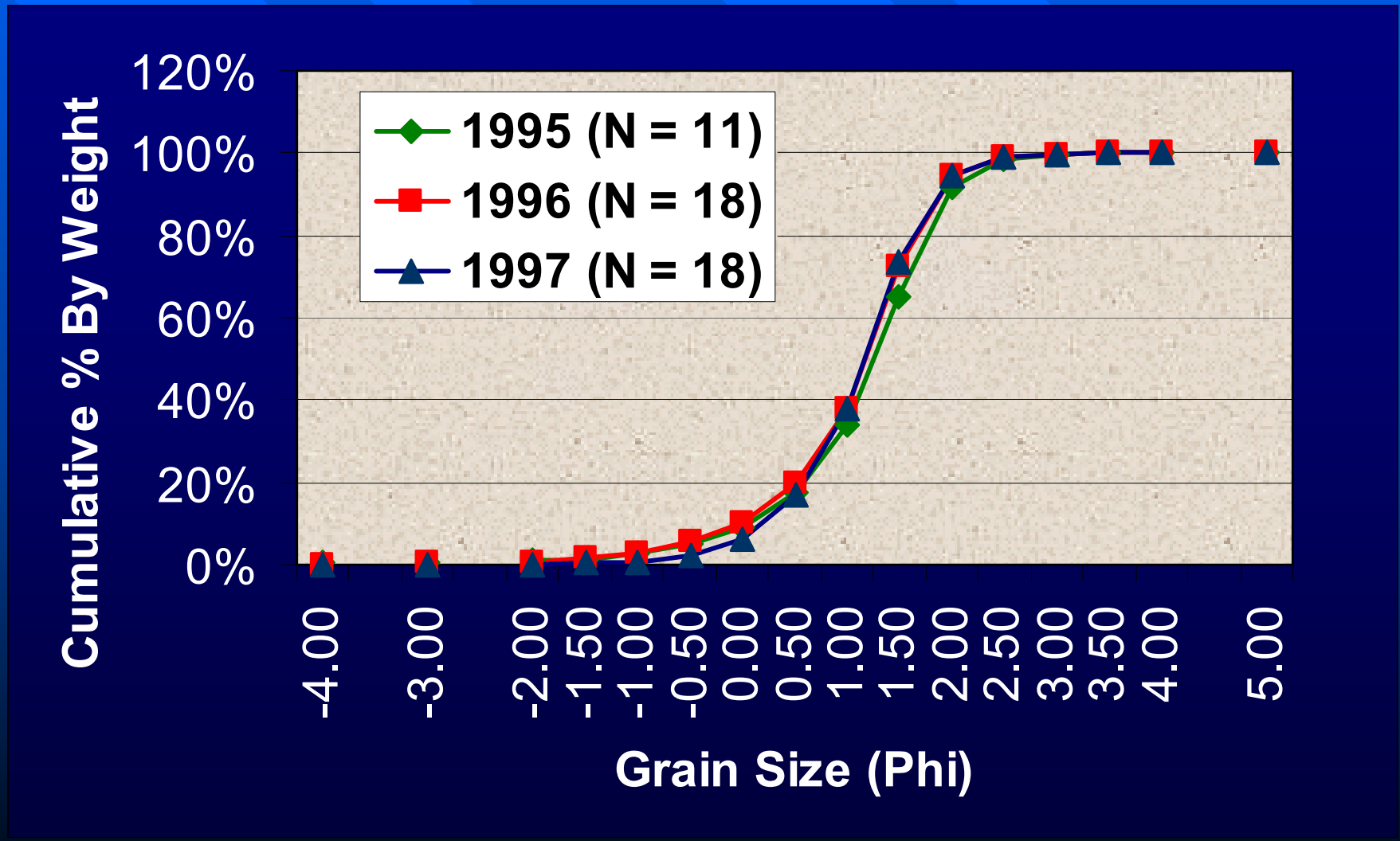



W2 (Control)
20
15
10
5
0
-5
-225
-200
-175
-150
-125
-100
-75
-50
-25
0
25
50
1995
1996
1997

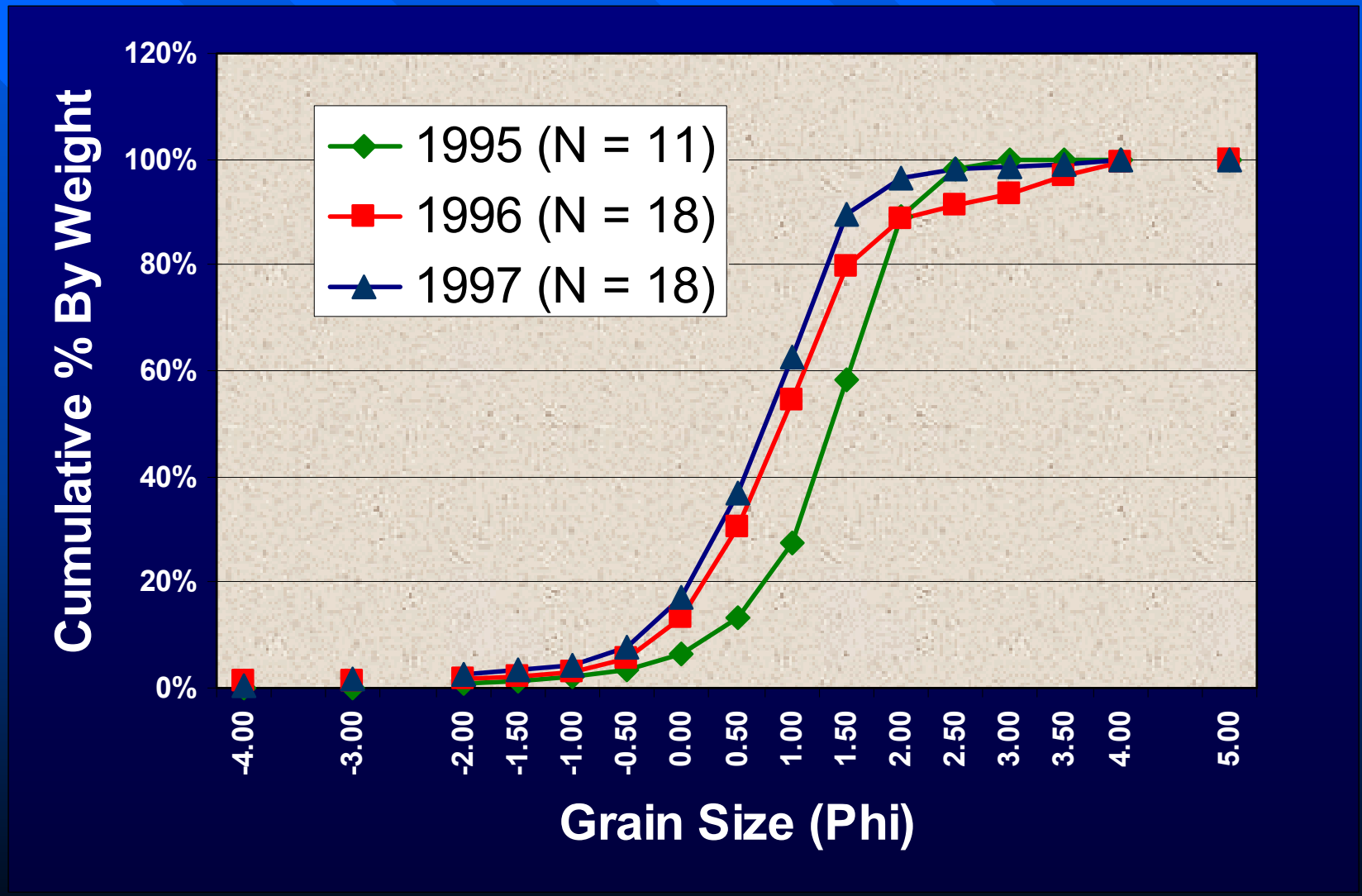

A3 (North Treatment)
20
15
10
5
0
-5
-225
-200
-175
-150
-125
-100
-75
-50
-25
0
25
50
1995
1996
1997


D3 (South Treatment)
20
15
10
5
0
-5
-225
-200
-175
-150
-125
-100
-75
-50
-25
0
25
50
1995
1996
1997

Sediments - Control



Sediments – North Treatment



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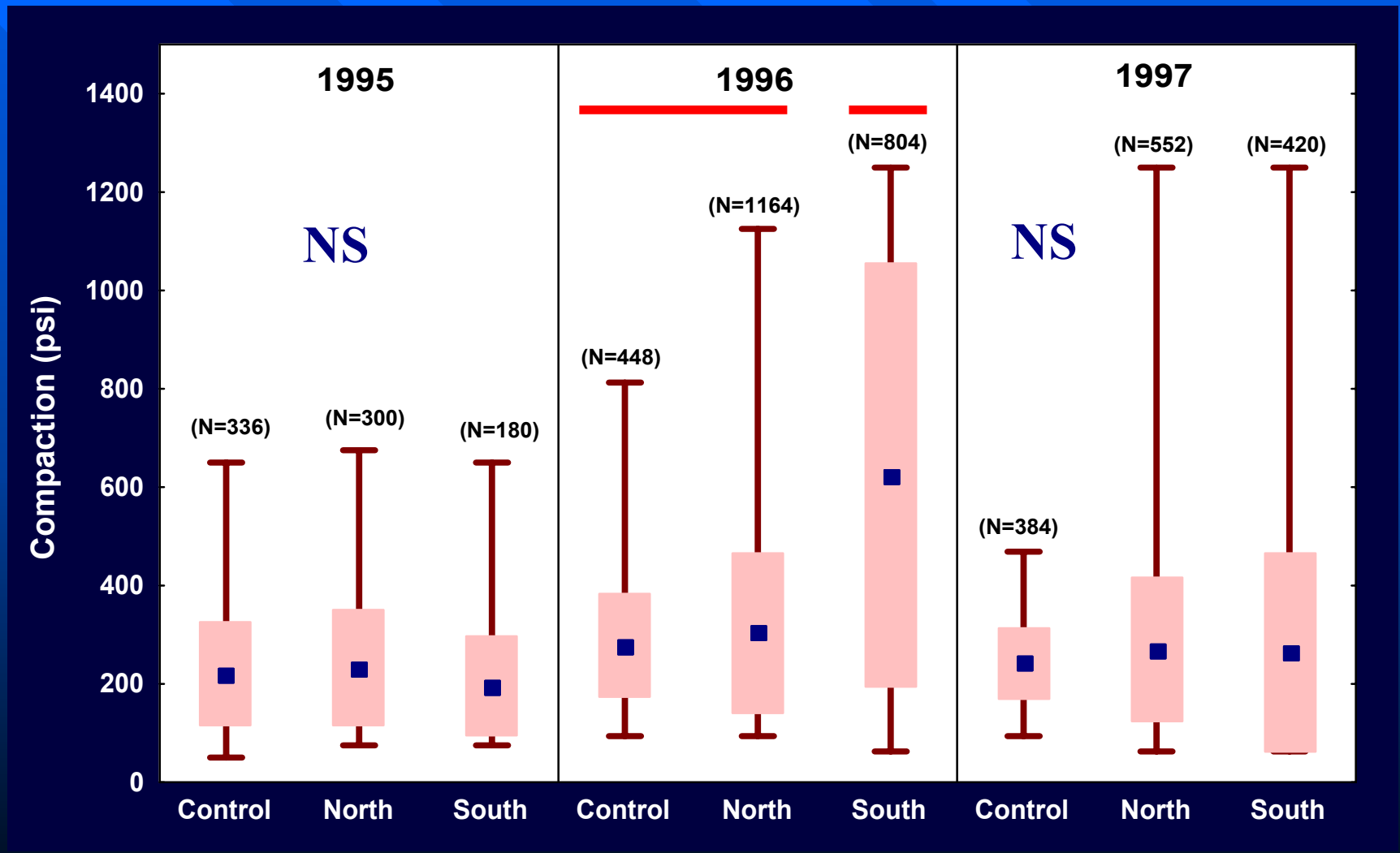
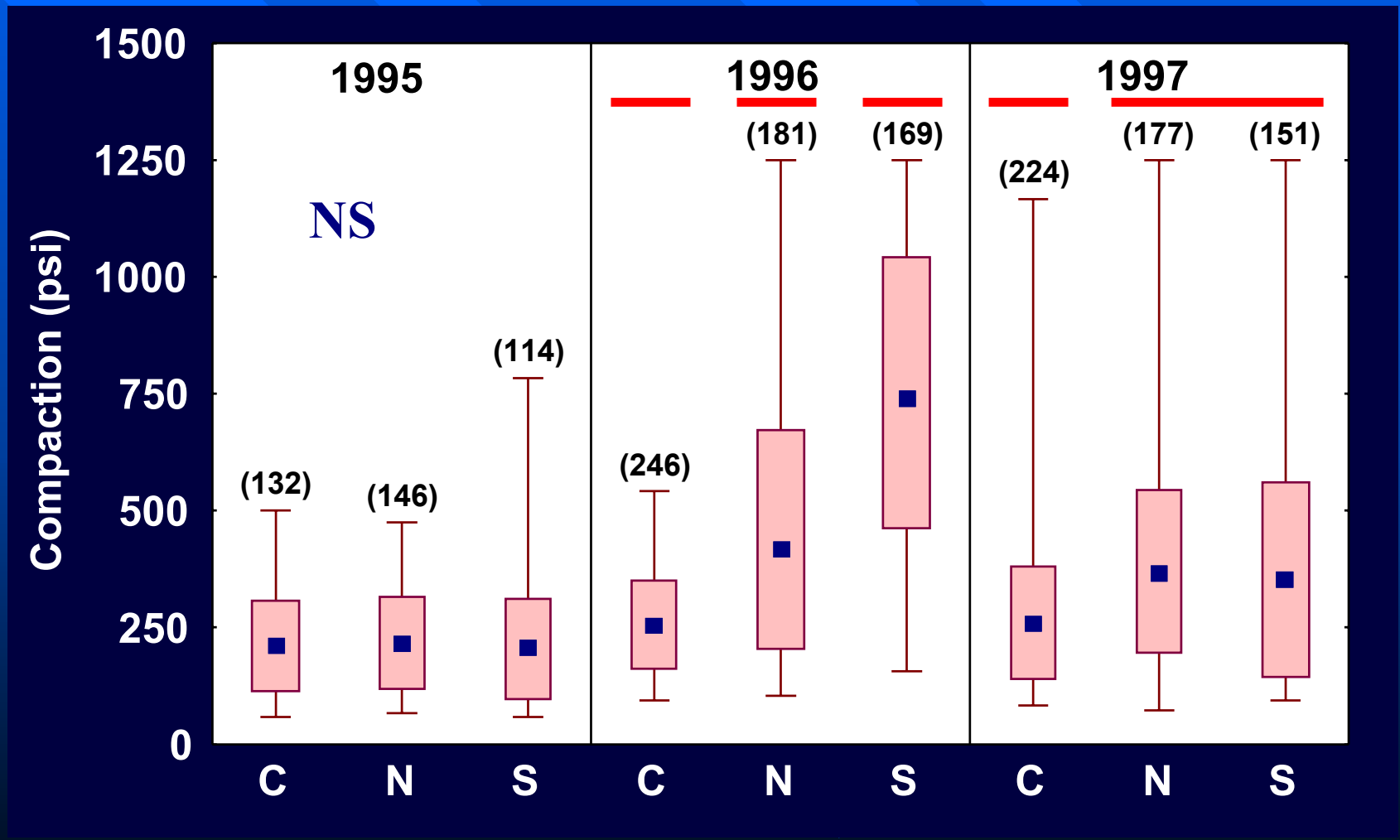
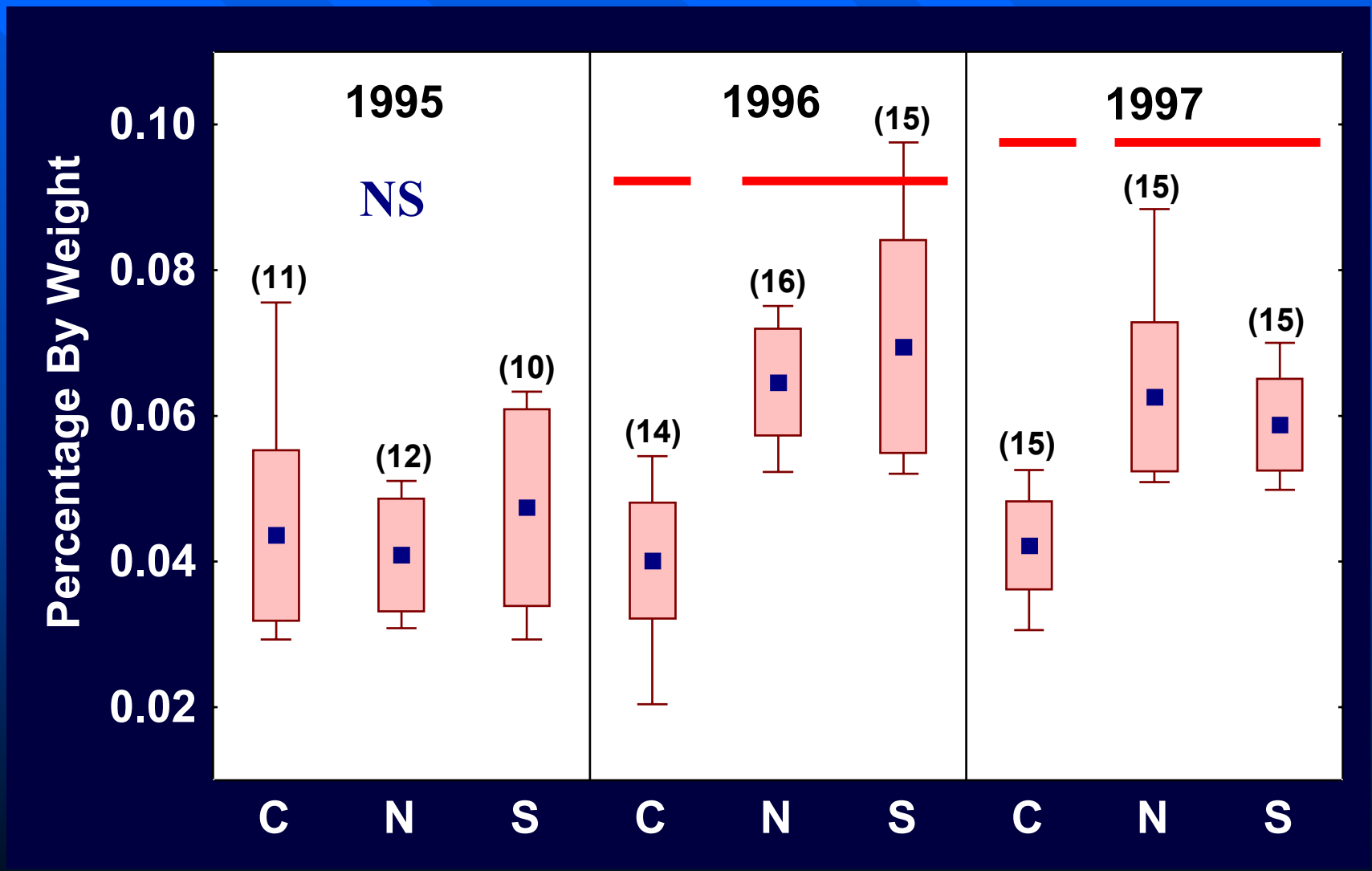
Compaction Seaward of Dune



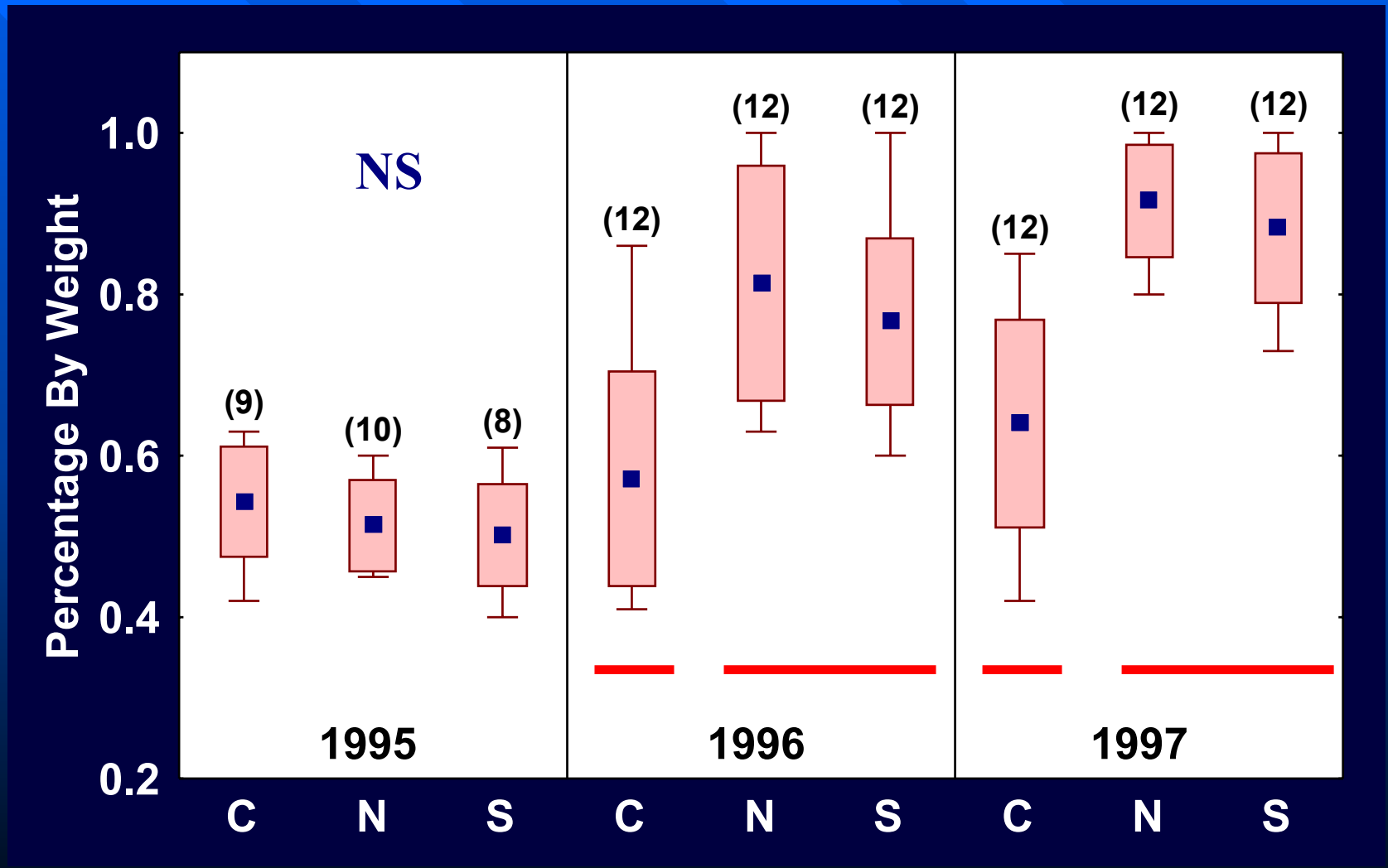
COMPACTION ADJACENT TO NESTS AND ABANDONED DIGS (0-30 cm)



SEDIMENT MOISTURE CONTENT



CALCIUM CARBONATE CONTENT OF SEDIMENTS

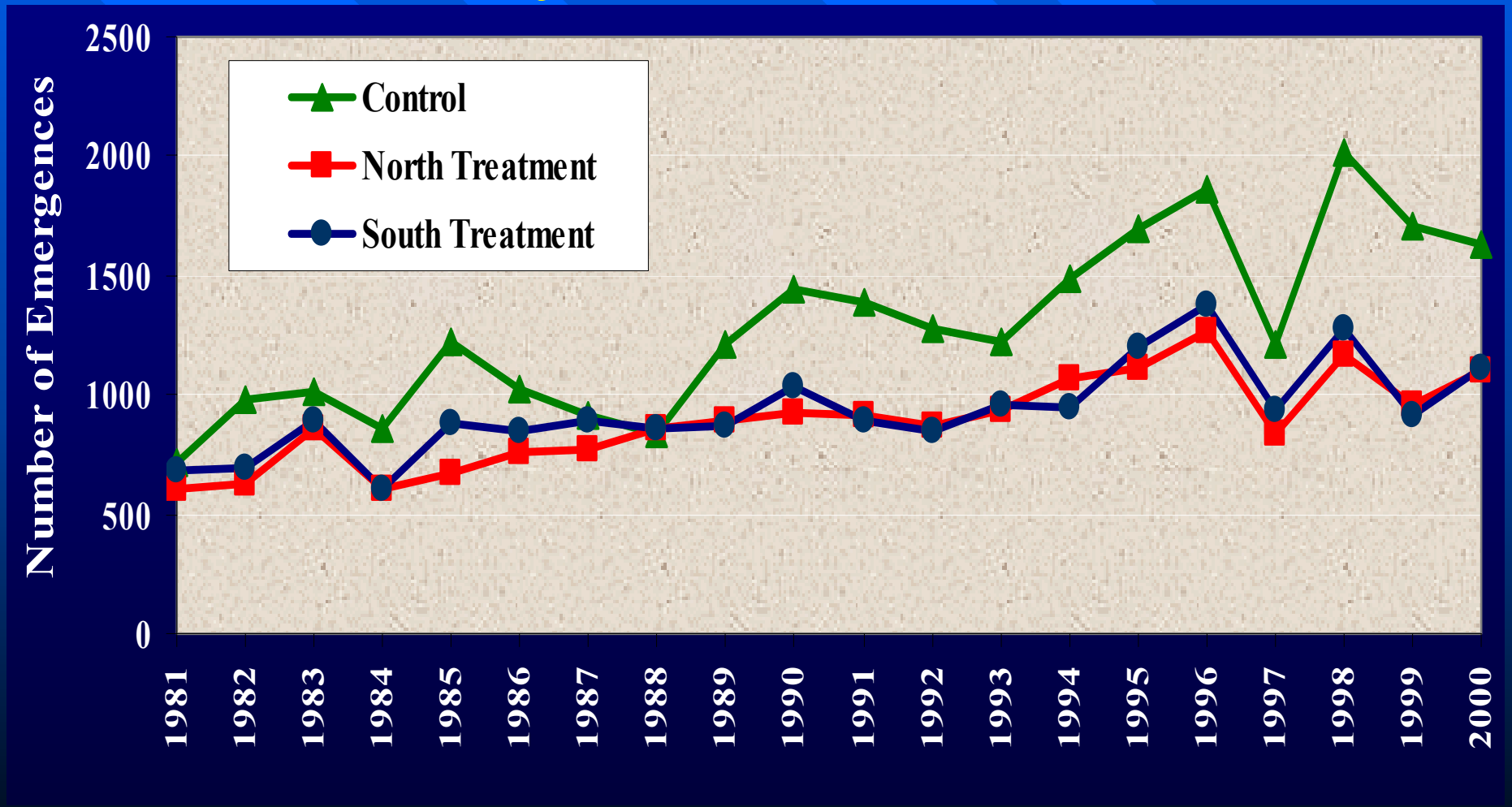


POTENTIAL EFFECTS OF BEACH NOURISHMENT

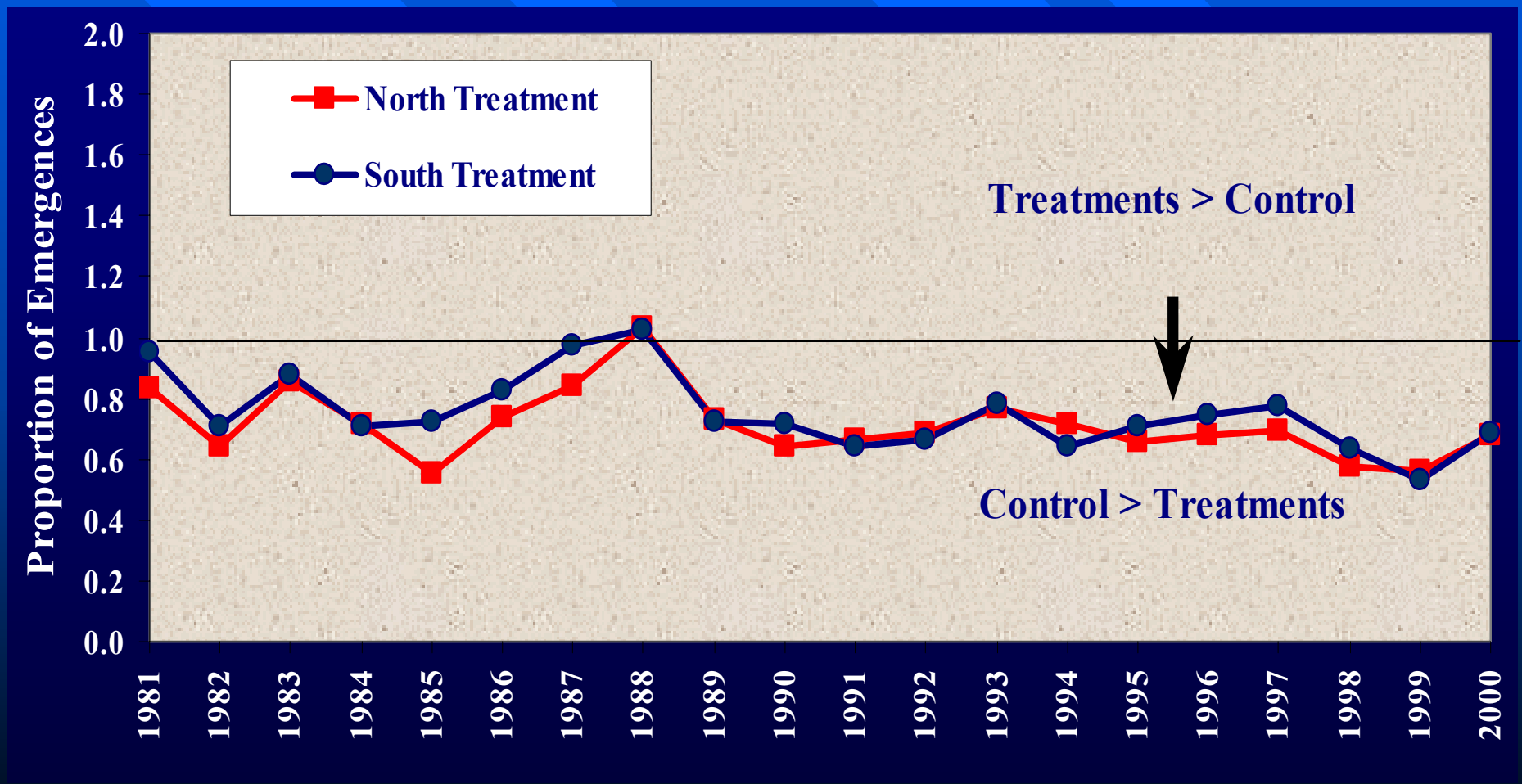
- Nesting Habitat (Quantity and Quality)
  - Nest Densities and Nesting Success
  - Energy Expenditures During Nesting
  - Spatial Distribution of Nests
- Incubation Environment
  - Reproductive Success
  - Hatchling Fitness and Emergence Patterns

EA I

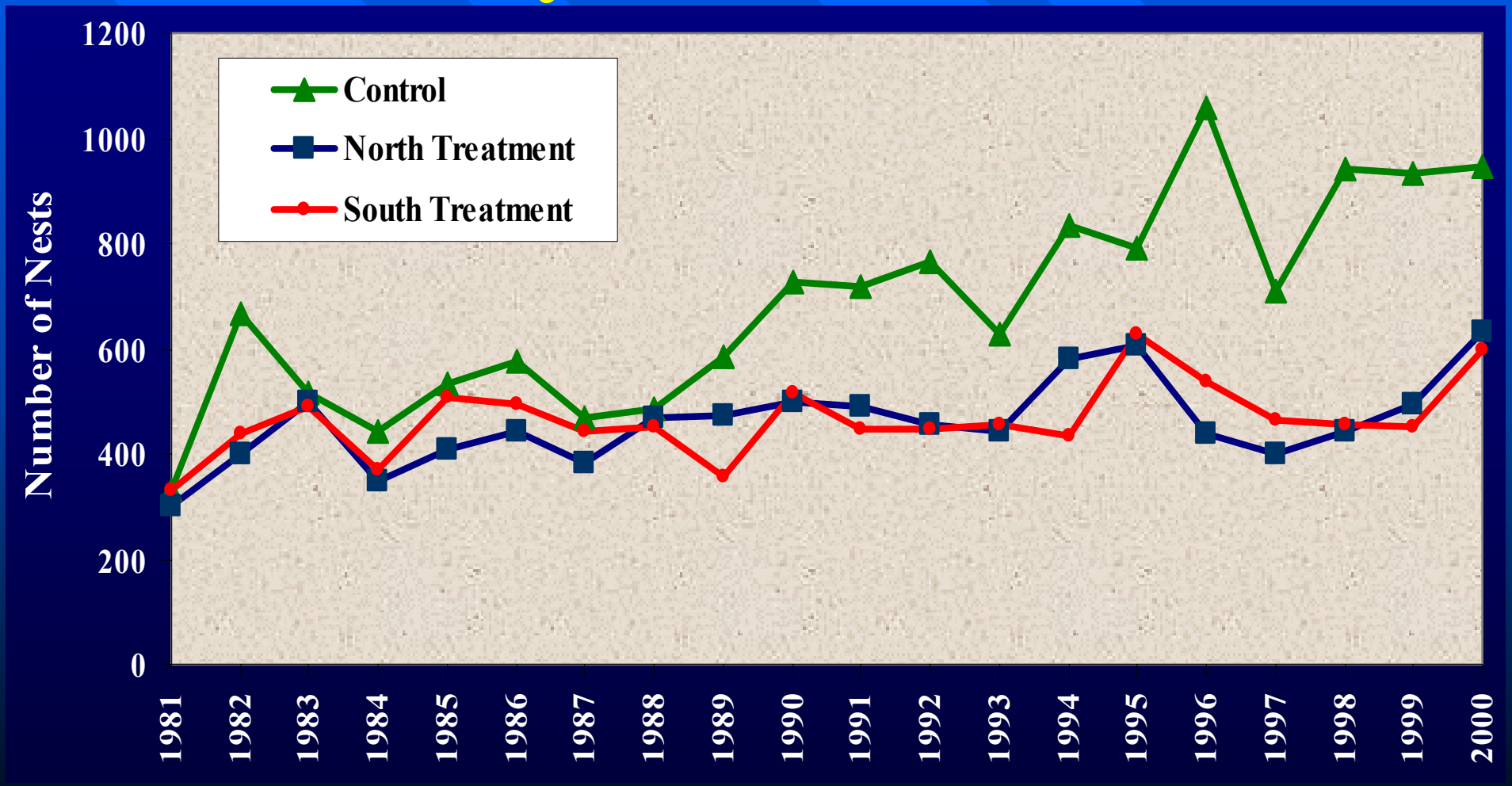
Number of Emergences by Treatment



Treatment Comparison of Emergences



Number of Nests by Treatment



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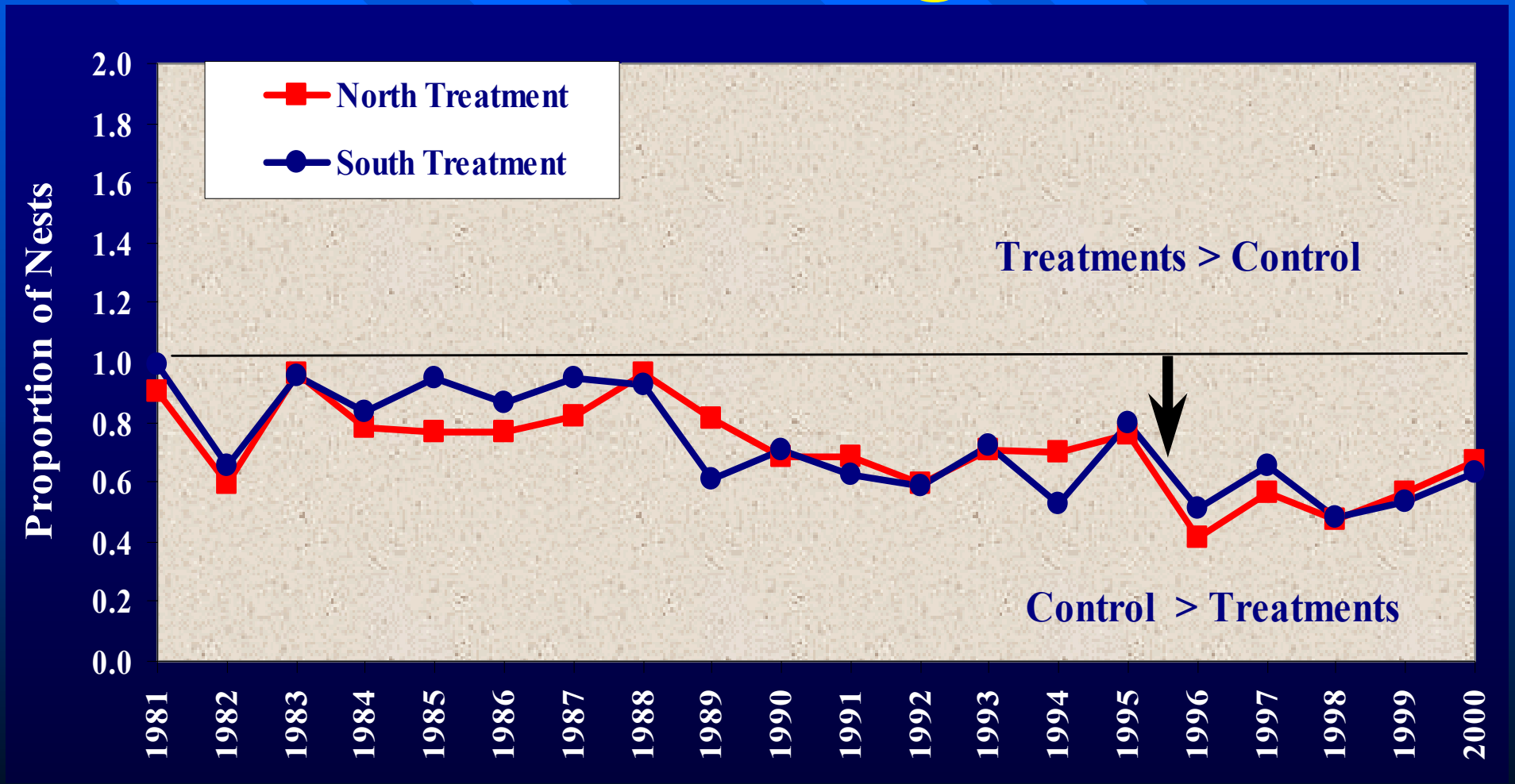
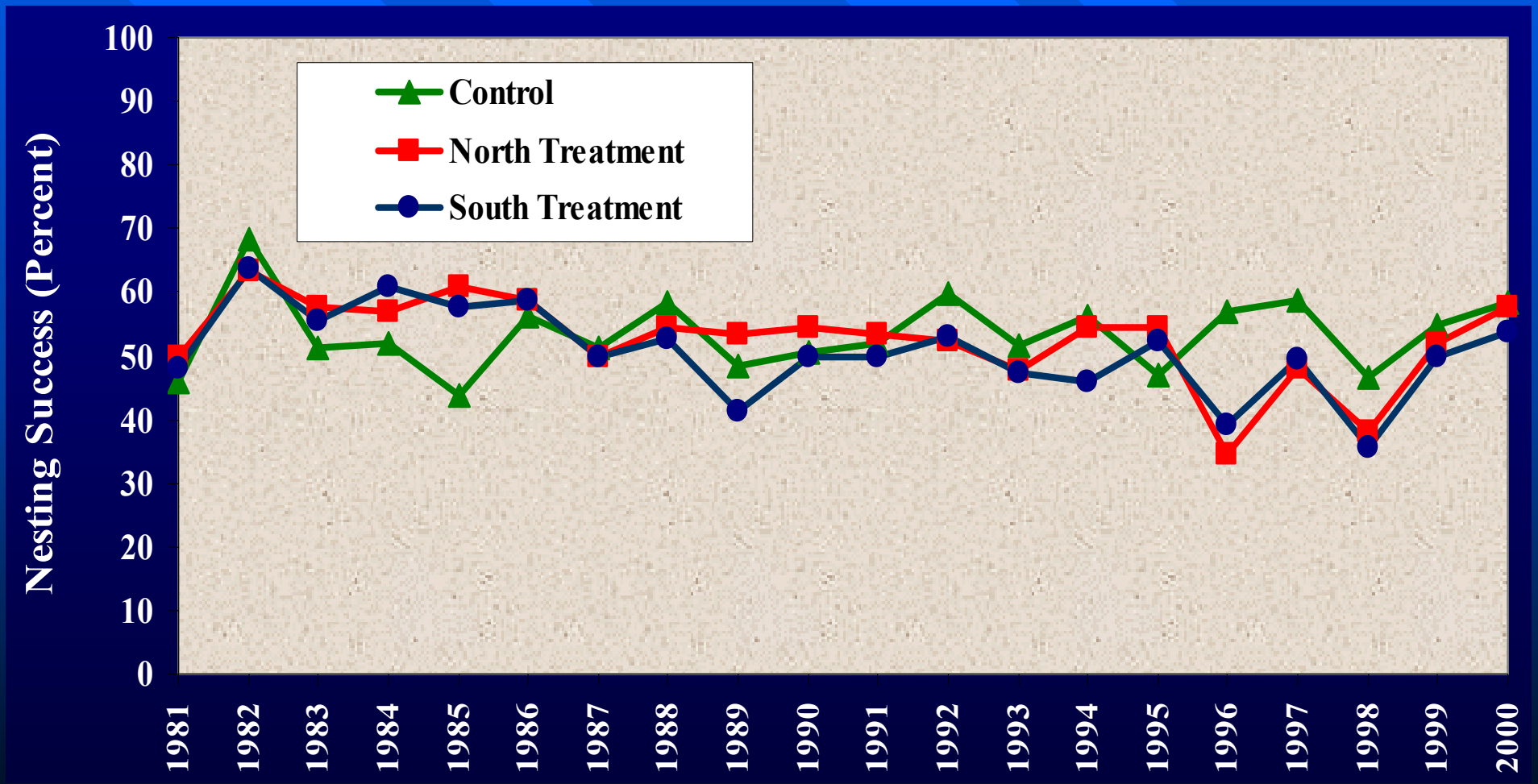
Treatment Comparison of Nesting



Nesting Success by Treatment



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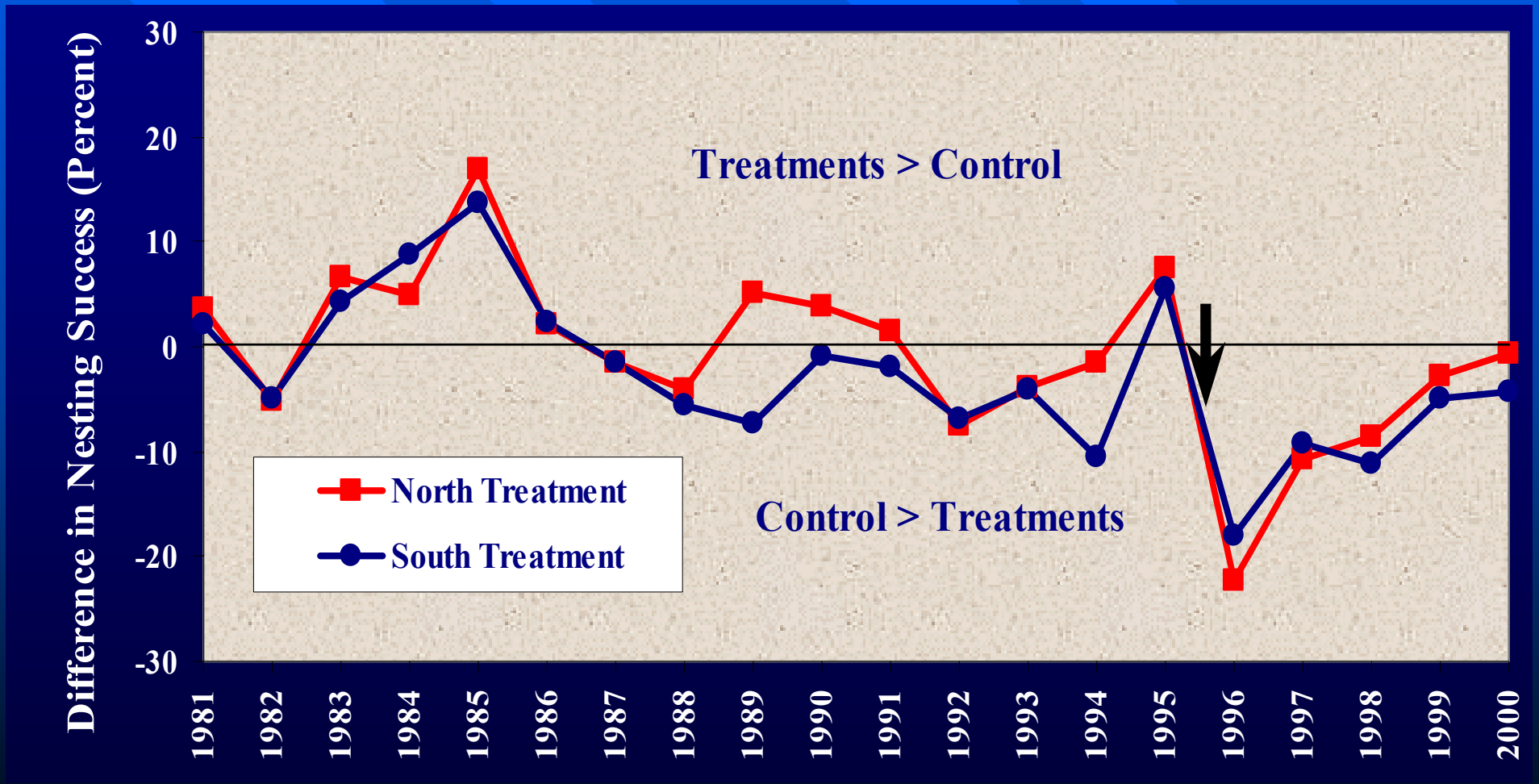
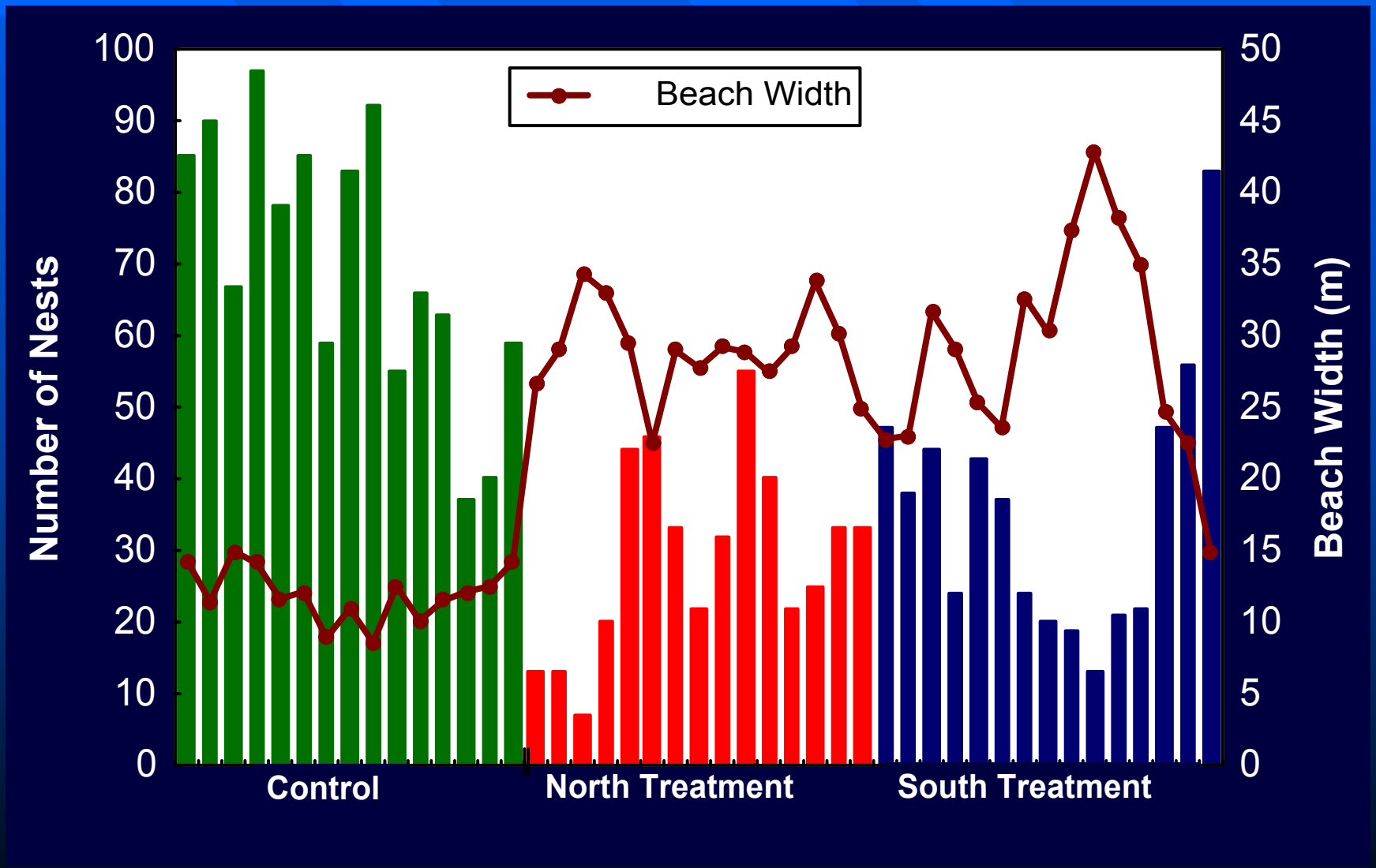
Treatment Comparison of Nesting Success



DISTRIBUTION OF NESTS AMONG SURVEY SECTIONS - 1996



POTENTIAL EFFECTS OF BEACH NOURISHMENT

- Nesting Habitat (Quantity and Quality)
  - Nest Densities and Nesting Success
  - **Energy Expenditures During Nesting**
  - Spatial Distribution of Nests
- Incubation Environment
  - Reproductive Success
  - Hatchling Fitness and Emergence Patterns

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ENERGY EXPENDITURES DURING NESTING

- Crawl Length
- Scarp Encounters
- Time Required to Excavate Egg Chamber
- Number of Attempts to Construct Nest
- Egg Chamber Construction

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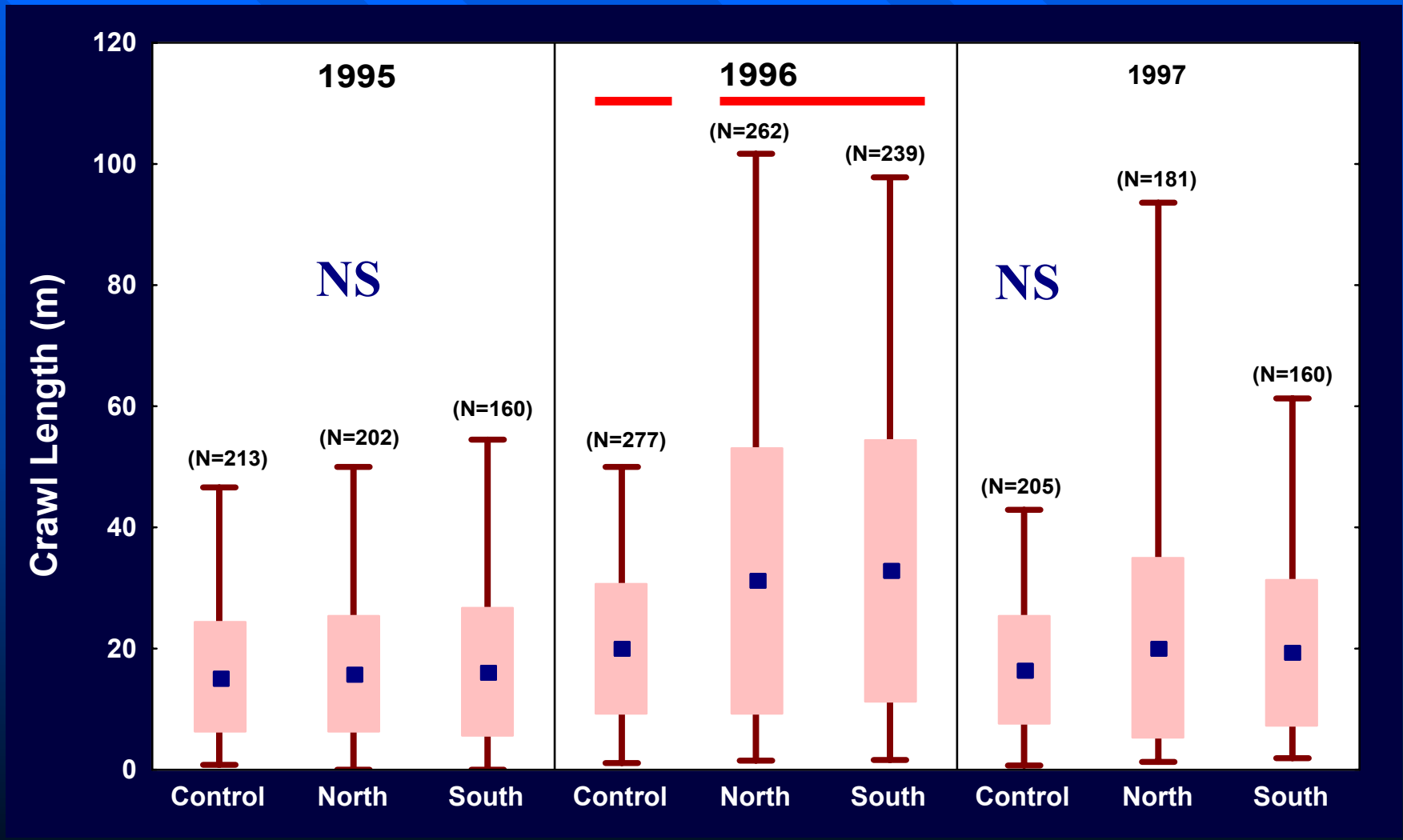
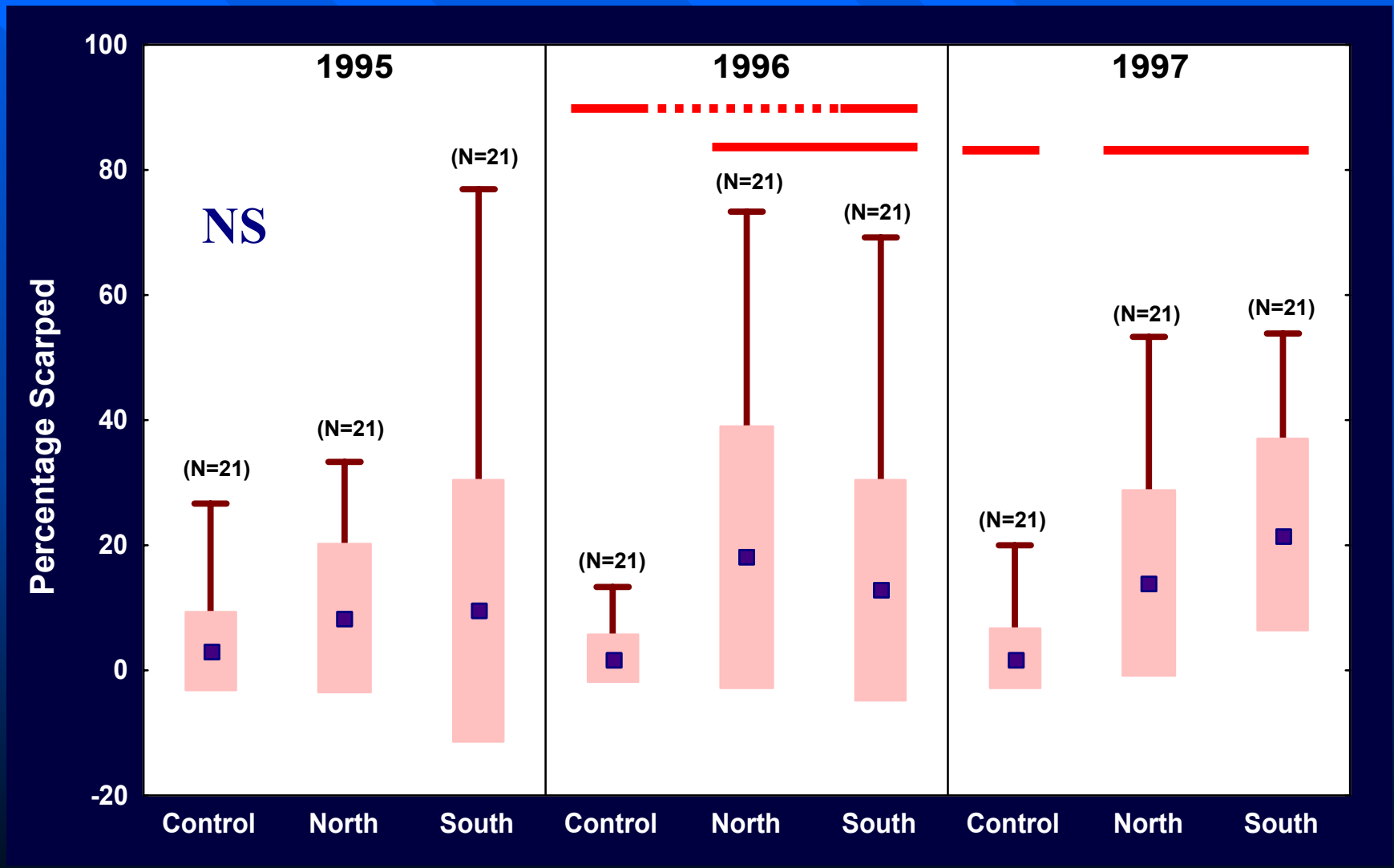
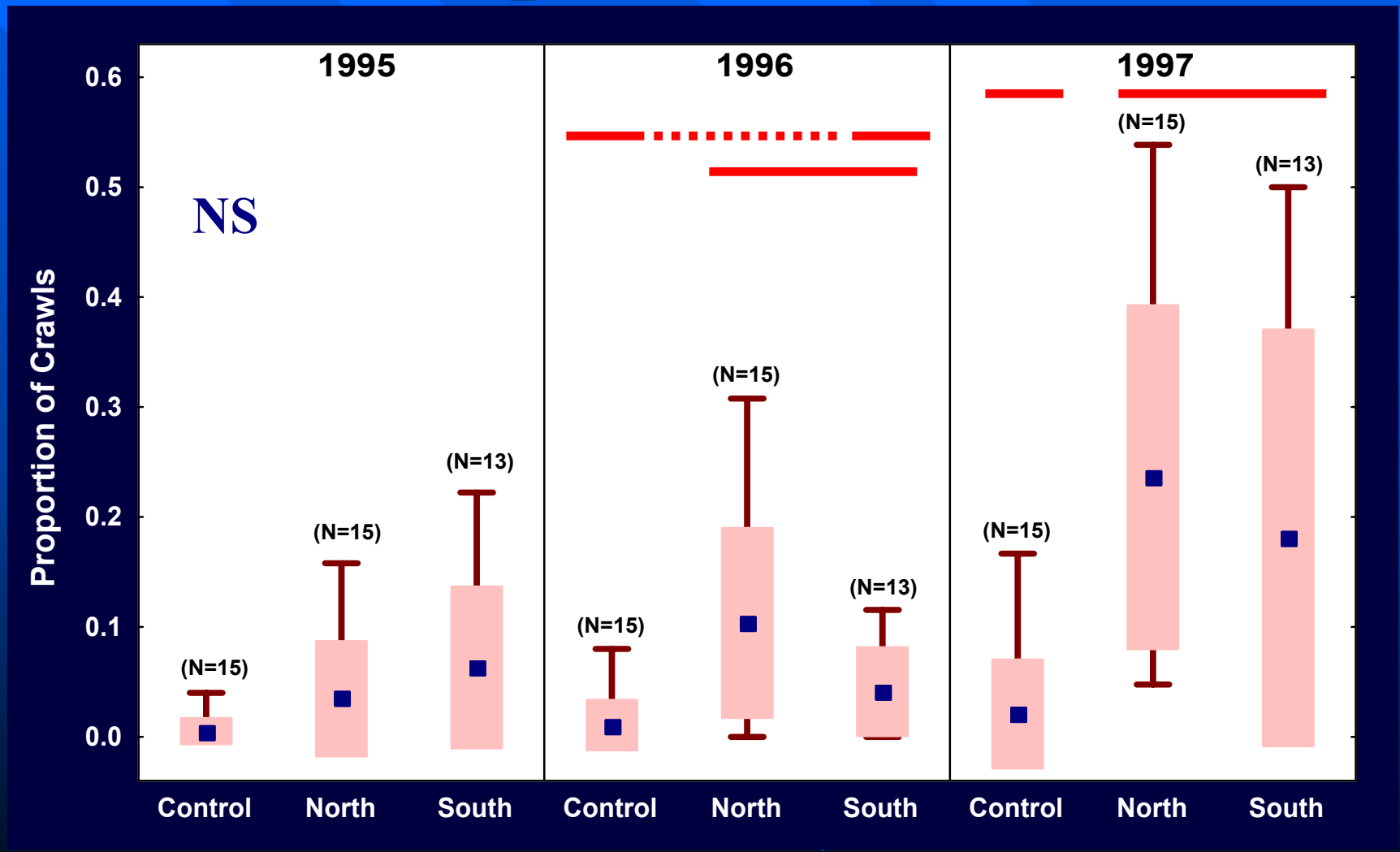
Crawl Length



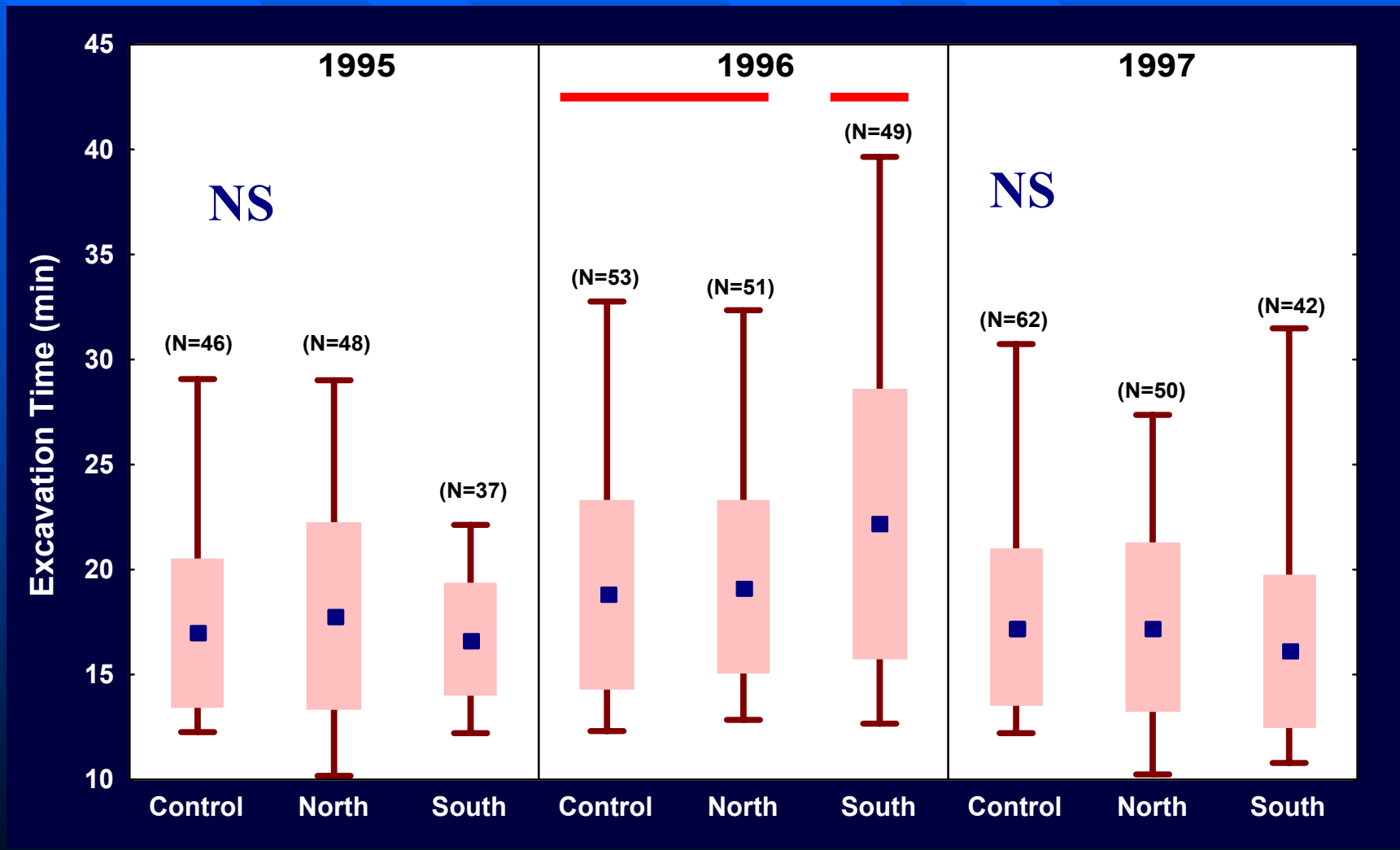
Percentage of Treatment Scarped



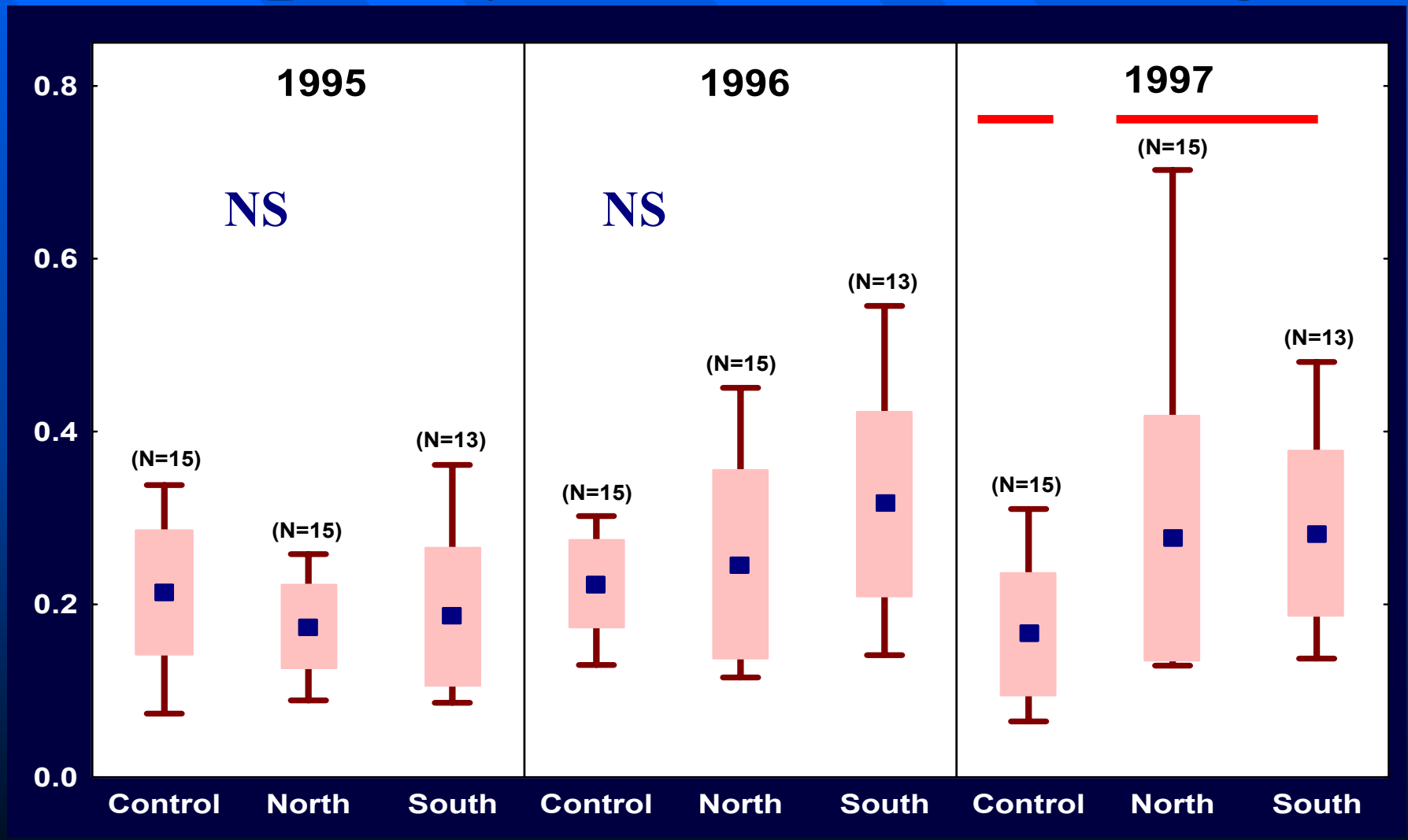
Scarp Encounters



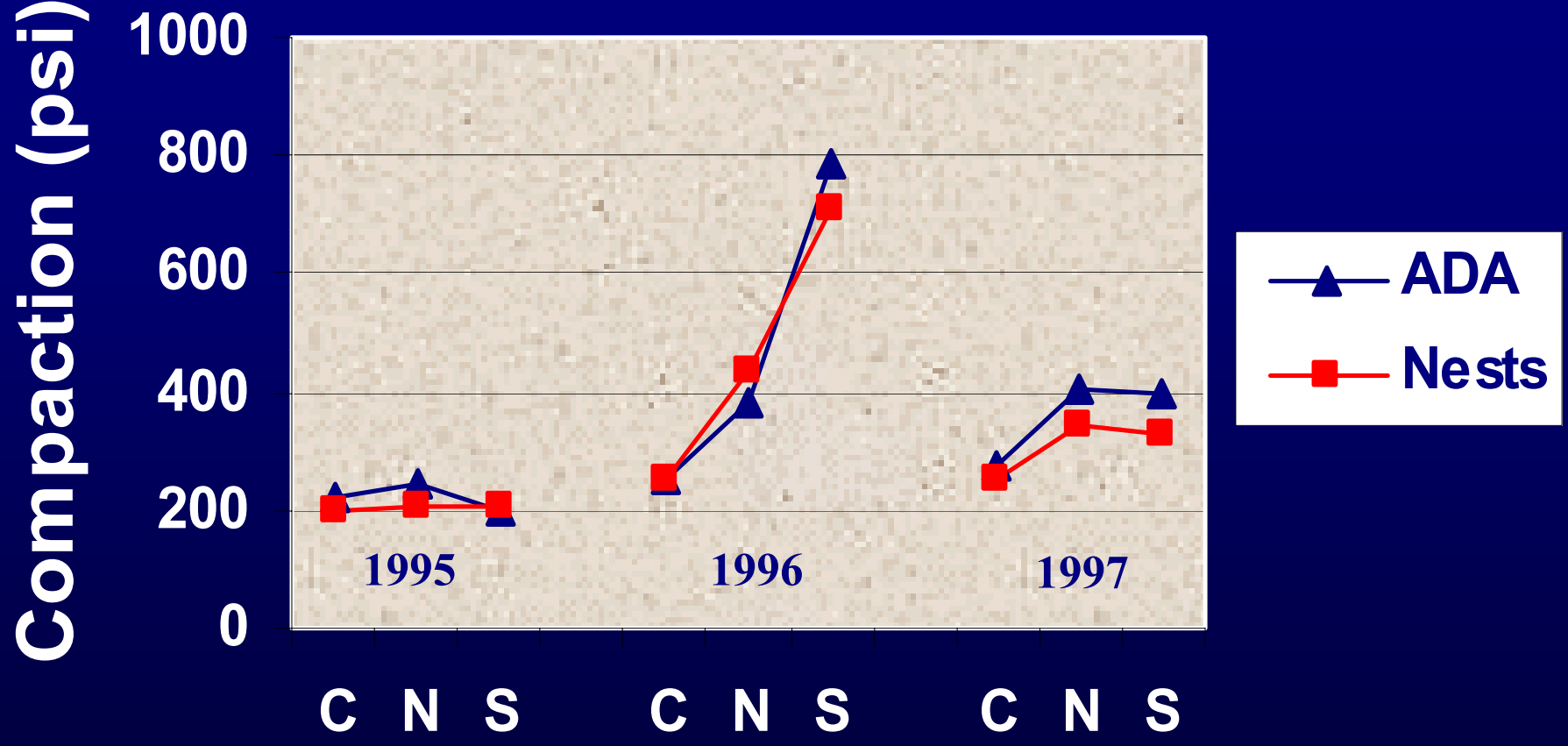
Time to Dig Egg Chamber



Frequency of Abandoned Digs



Compaction at Nest Sites vs ADA



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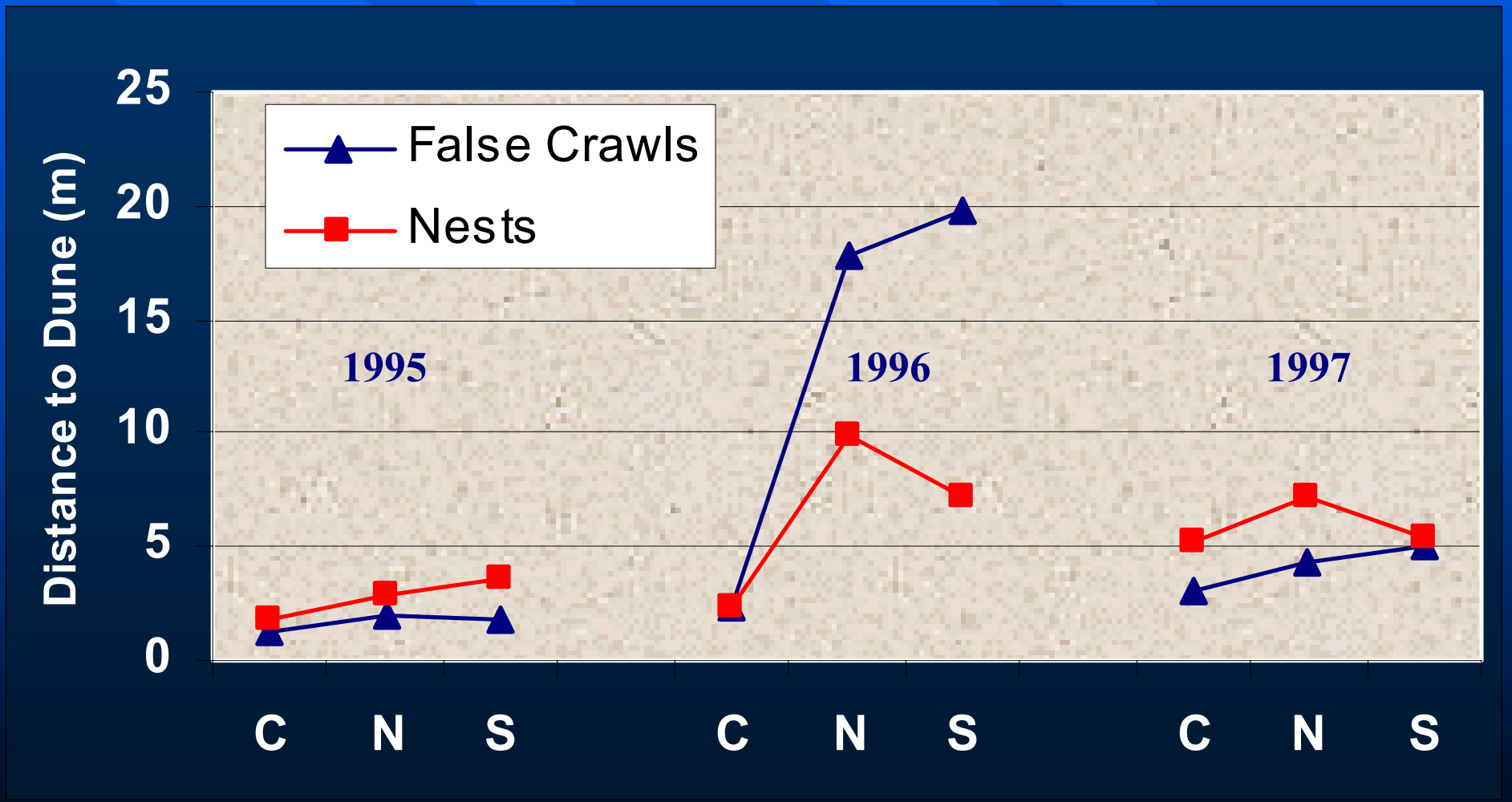
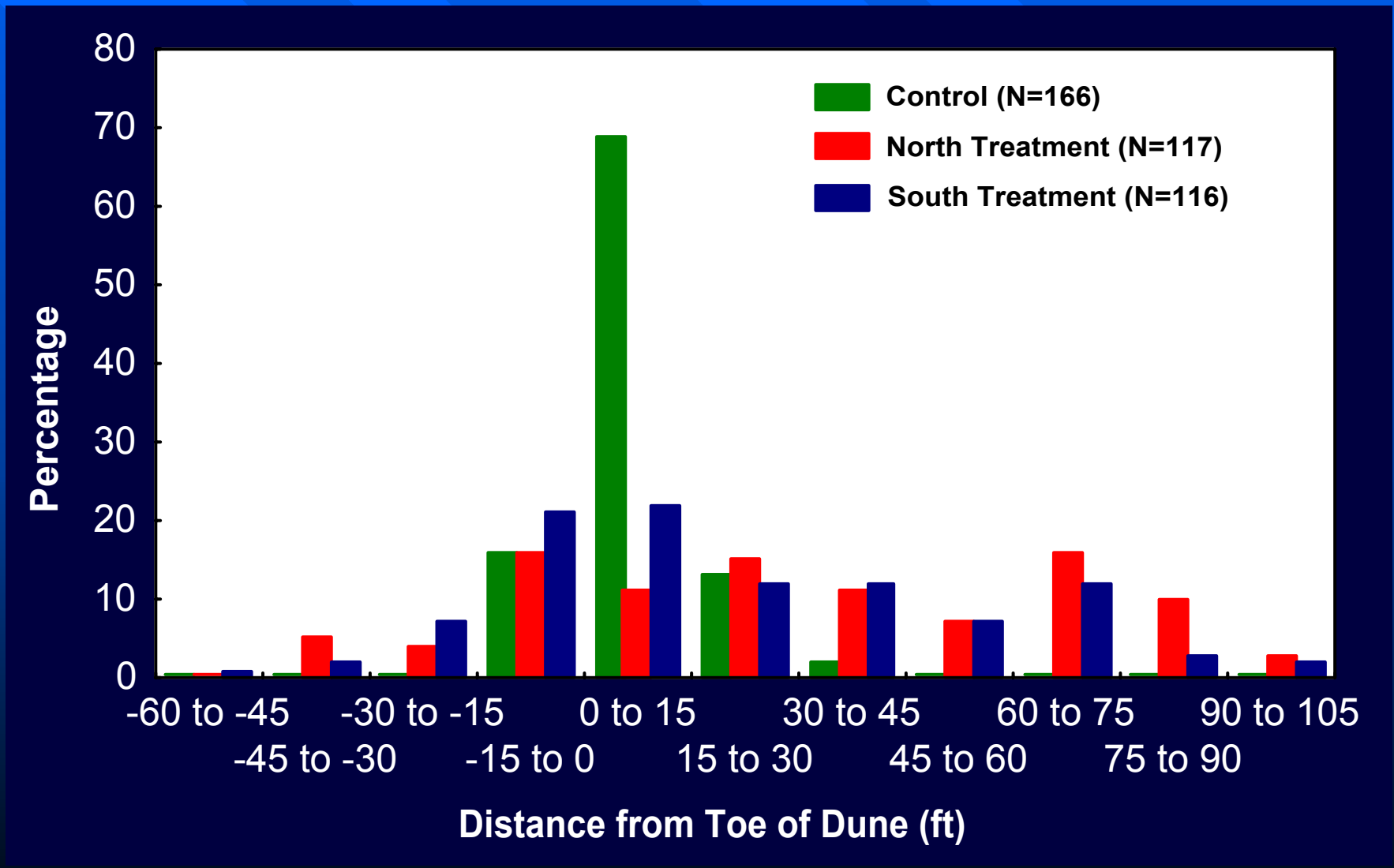
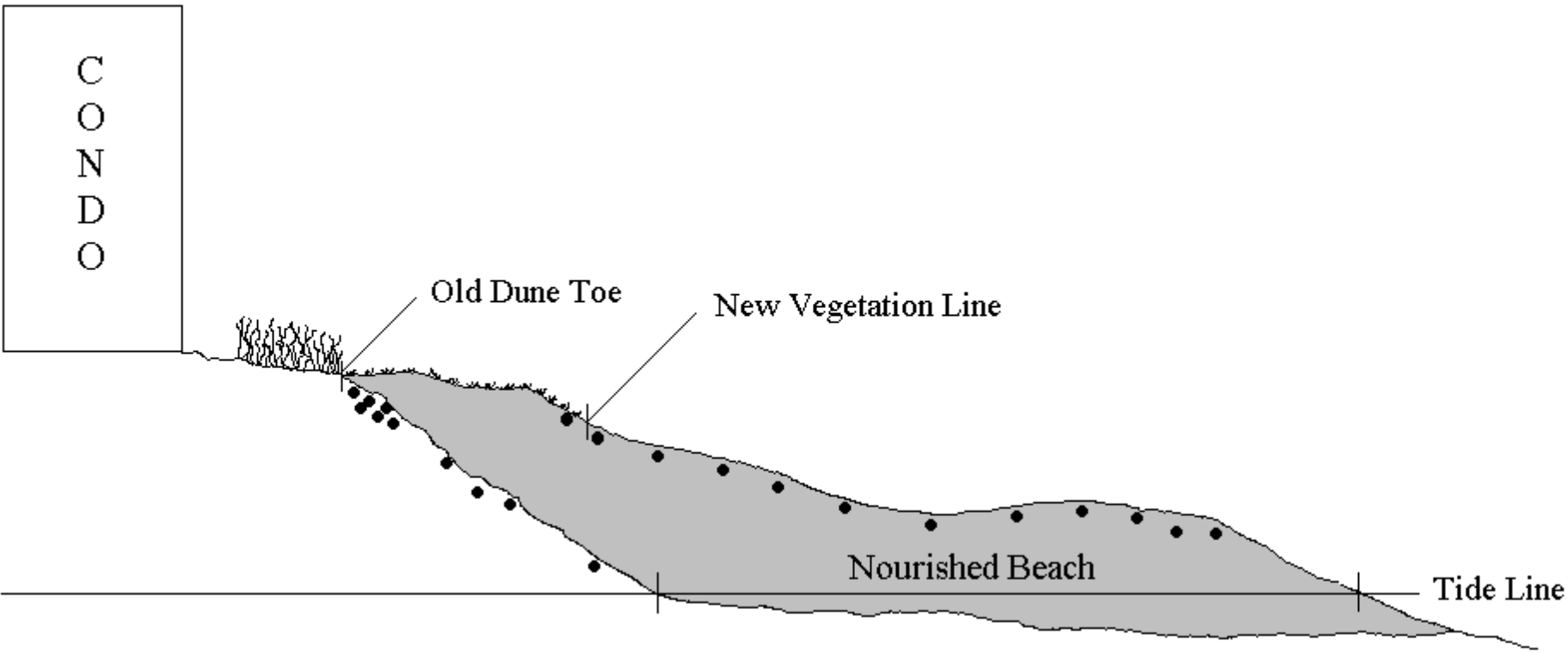
EA I

Distance to Dune
Nests vs False Crawls



DISTRIBUTION OF NESTS ACROSS BEACH




CONDO
Old Dune Toe
New Vegetation Line
Nourished Beach
Tide Line

POTENTIAL EFFECTS OF BEACH NOURISHMENT

- Nesting Habitat (Quantity and Quality)
  - Nest Densities and Nesting Success
  - Energy Expenditures During Nesting
  - Spatial Distribution of Nests
- Incubation Environment (Quality)
  - Clutch Depth
  - Nest Fate (Exposure to Disturbance)
  - Reproductive Success

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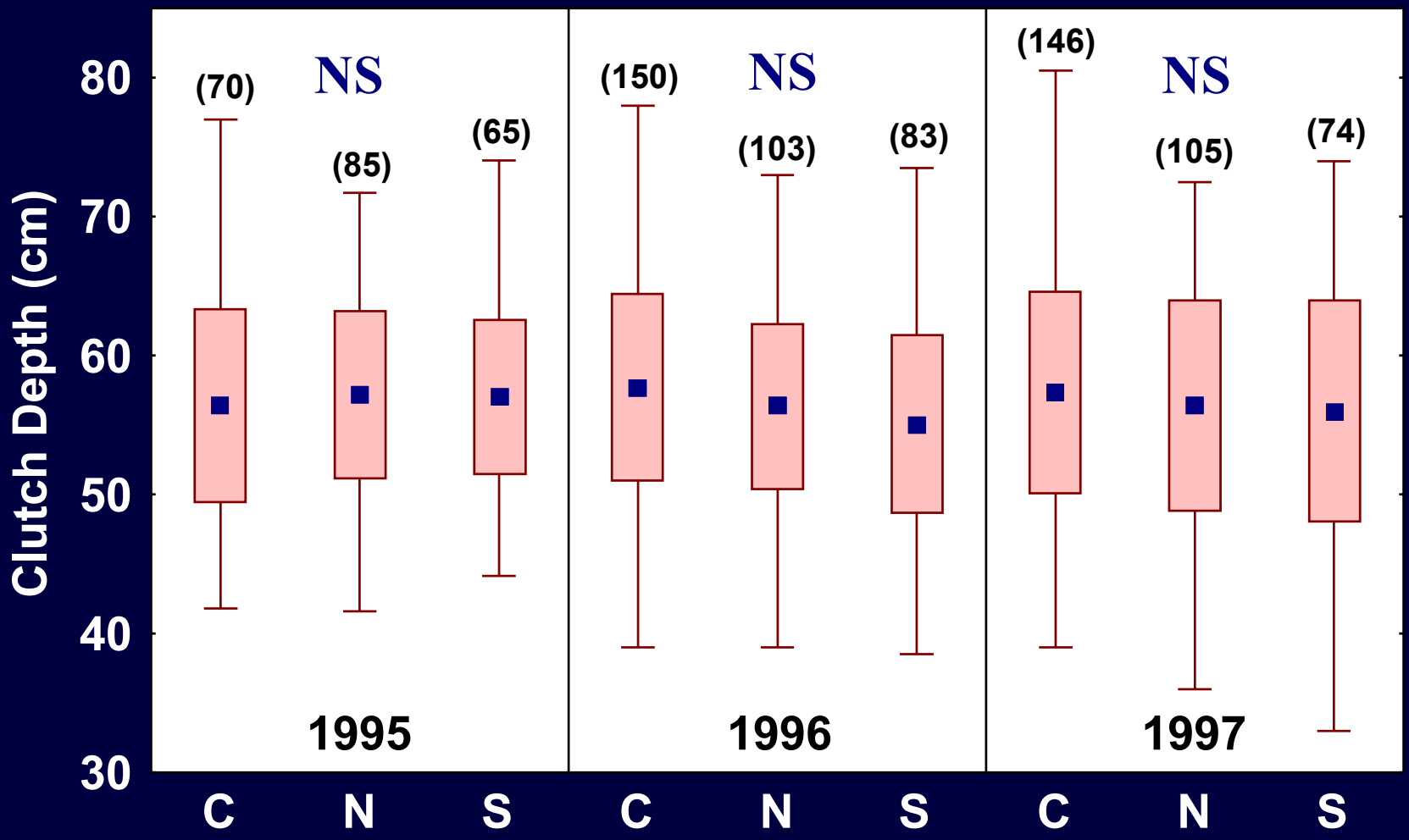
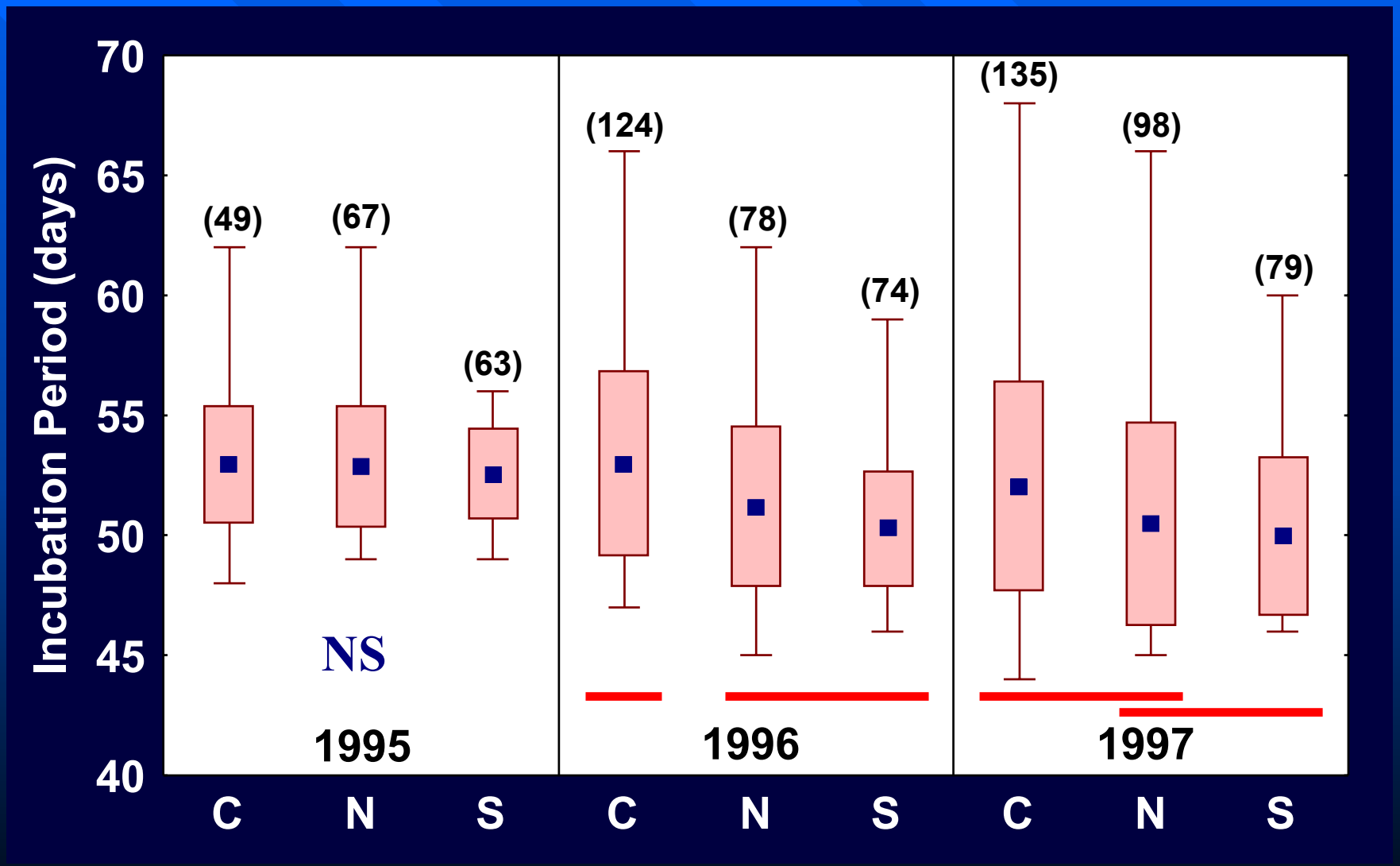
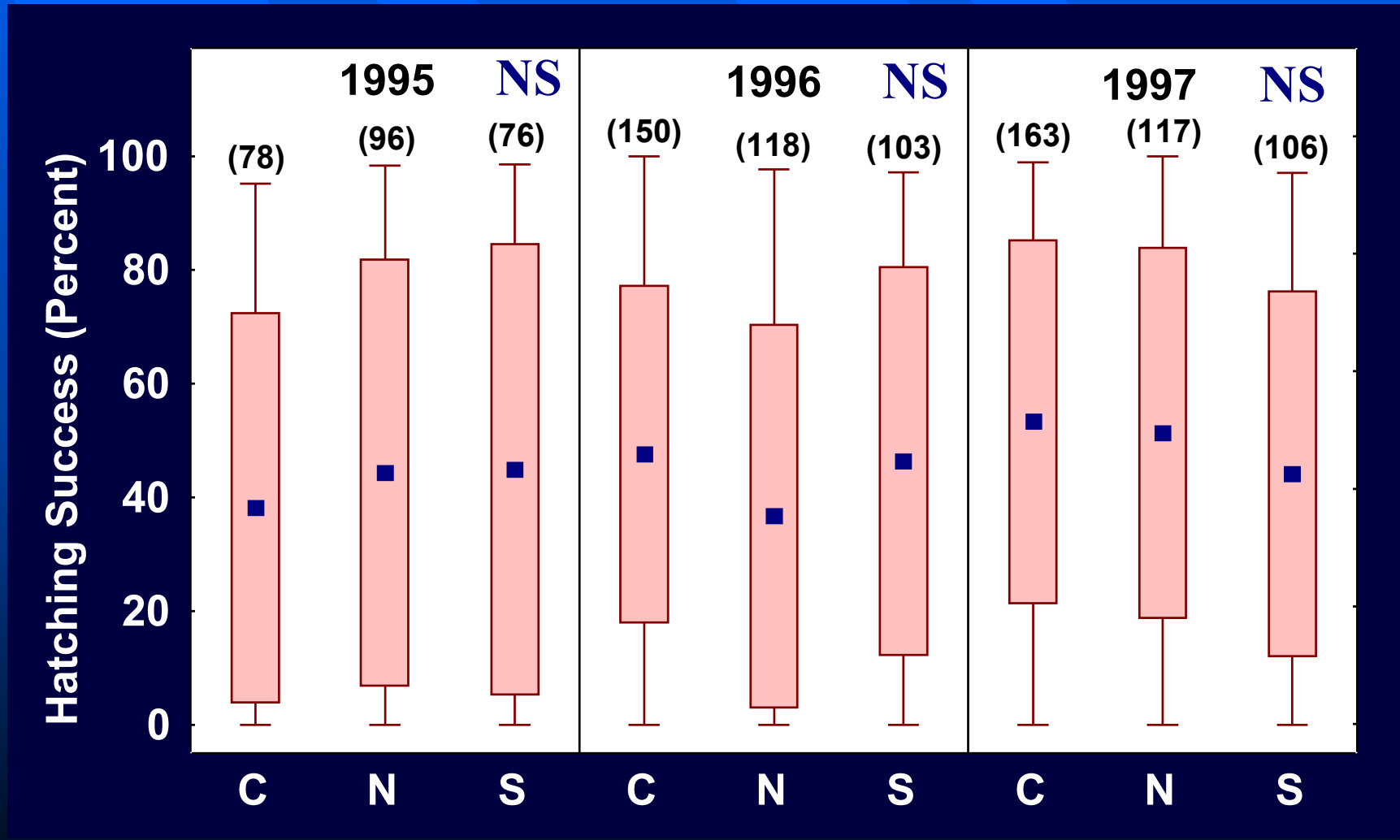
INITIAL CLUTCH DEPTH



INCUBATION PERIOD



HATCHING SUCCESS INCLUDING WASHED OUT NESTS



Summary

- Emergence Patterns and Nest Densities
  - No Change in Emergence Patterns
  - No Increase in Nesting
  - Reduction in Nesting Success
- Increase in Beach Width
  - Significantly Longer Crawls
  - Broader Distribution of Nests
  - Habitat Suitability Determined Early in Crawl

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Summary
(Continued)

- Compaction
  - Increased Digging Times
  - Digging Times Reduced by Tilling
  - Increased Number of Abandoned Digs
  - No Effect on Clutch Depth
- Change in Beach Profile
  - Altered Dune Horizon
  - Nest Loss and Scarping During Equilibration

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Summary
(Continued)

- Incubation Environment Changed
  - Sediments More Compact
  - Sediments Coarser With More Shell
  - Sediments Darker and Warmer
  - Sediments More Moist
- Incubation Period Shortened

EA I

Summary
(Continued)

- Nest Fate
  - Fewer Nests Overwashed During Year 1
  - Larger Percentage of Nests Washed Out
- Reproductive Success
  - Nourished Beach Did Not Reduce Reproductive Success

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RECOMMENDATIONS

- Carefully Evaluate Fill Material for Beach Compatibility
- Assess Feasibility of More Natural Fill Template
- Ensure Adequate Tilling
- Protect Nests On Seaward Portion of Beach
- Identify and Evaluate Feasibility of Alternative Construction Methods (Stockpiling)
- Implement Monitoring Programs That Isolate Effects of Nourishment (Baseline & Control)

EA I